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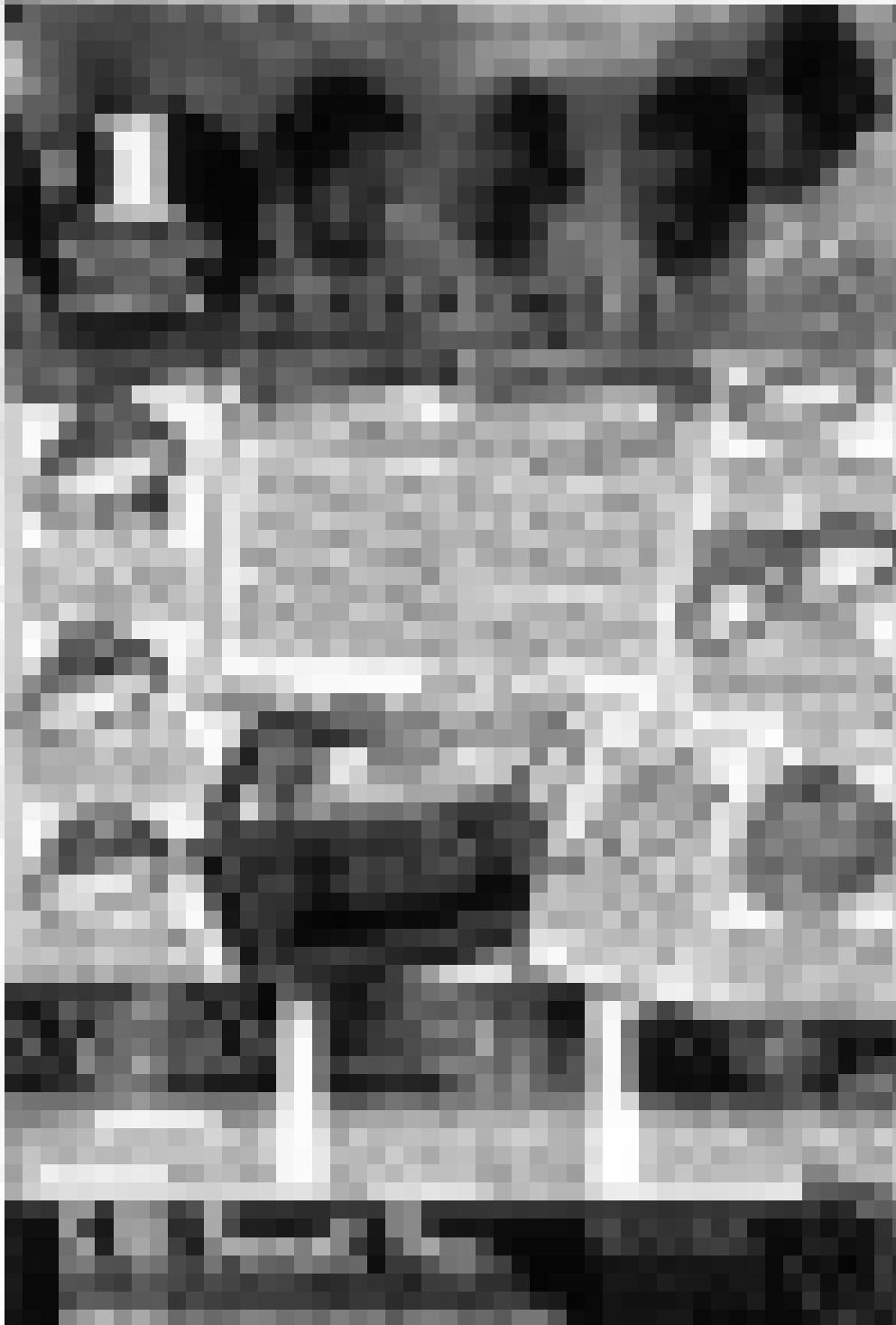
# ASTOUNDING

## STORIES



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by ERIC FREEMAN



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**Number 5**

JANUARY  
1937

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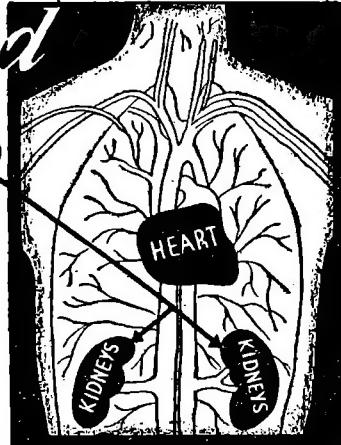
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# Beyond Infinity

*A tale of scientific forces which protect life against unknown powers of destructive genius*

by CHAN CORBETT

THE HUMAN RACE was at bay. Deep within the bowels of the Earth its scattered remnants were making their last desperate stand against the teeming hordes of Antares. It was a losing fight. Three times interstellar space had erupted its strange peoples upon a beleaguered solar system; twice the invaders had been beaten off at tremendous cost; but now the task seemed hopeless. Earth was doomed—its long line of imperfect evolution destroyed, its mounting civilizations cut off, and the green face of the planet given over to aliens from an alien system.

Within the hollow round of the vast underground cavern, ten miles beneath the surface of the New Mexican desert, the huddled people—the old men, the women, the children, the scanty reserves—watched the visor screens with a dull despair.

High above, crouched behind an impermeable shield, the gallant defenders were making their last stand at the five-mile lock of the huge shaft that led to the surface. Inexorably, they had been driven back from the one-mile, two-mile, three-mile locks by the mighty weapons of the invaders. Once past the five-mile barrier, only one other, a scant two miles from the artificial cave, intervened between them and destruction.

There were only a thousand of them now. There had been five thousand when the long-disused alarm system had clanged its raucous warnings around the Earth. The people of the scientific col-

ony of New Mexico had dived headlong into the great shaft, had descended in swift magnetic elevators into the bowels of the Earth, down to the great, artificial bore that had been prepared a hundred years before against such a day.

Children clung to their parents, frightened; infants wailed against their mothers' breasts; women held tenaciously to snatched-up, incongruous possessions, treasures to be saved from the alien invaders. Men of fighting age swore under their breaths, their faces taut and grim, and buckled their flame guns and conite disruptors hastily to their belts.

All over the world similar tragic, heartbreaking scenes were being enacted. The depths of the Earth were honeycombed with burrows, in which the harried Earthlings might take refuge when the next wave of stellar invasion broke overwhelmingly upon the solar system. For they had known that the immunity of millions of years was a thing of the past.

The first swift invasion, in the year 3195, had caught Earth unprepared. Interplanetary flight had been a reality for a dozen centuries before, but there had been no menace to Earth's billions in that. Of all the Sun's satellites, only Mars and Venus had been found to harbor forms of life. A thin, degenerate race clung sluggishly to the shrunken vegetation areas of Mars, forgetful of past glories. Venus was still void of the higher forms of life—a dense, steamy jungle in which weird monsters prowled.



DOLB

*So engrossed was the Antarian in the sheets of equations  
that he did not notice the Earthman's approach.*

The bolder spirits looked longingly to the vast reaches of interstellar space, but voyagings, even to the nearest star, seemed impossible of accomplishment.

Then, without warning, came the first attack—a mass drive of thousands of gleaming metal space ships, hurtling almost at the speed of light from far-off Rigel. A migration of a whole people,

fleeing from impending doom, seeking refuge on a world where life might be sustained. Earth beckoned them as such a world.

They were a strange race—vegetative rather than animal in form and function, and slightly in advance of Earth's population in scientific knowledge. Their first slashing attack was victorious.

They landed in the lush jungles of the Matto Grosso, ruthlessly obliterating human life over a constantly widening area. After the first stunned shock of surprise, however, the nations of the world rallied, sank their sectional differences, and in the great Interstellar War of 3207 overwhelmed the intruders, and slew them to the very last Rigellian. In the doing, however, a billion humans died.

From Rigellian captives a very little had been learned. It was extremely difficult to establish communication—vegetative thought processes could not readily be transmuted into recognizable form. But enough was discovered to send the nations digging feverishly into the ground, as deep as modern instruments could bore, where life might exist for indefinite years.

For, said the captives, the whole universe was in motion. Space seethed with the ships of alien hordes, come from no one knew where. Fright dyed the bulbous bodies of the Rigellians purple as they spoke of these beings, as strange to them as the Rigellians were to the people of Earth. Beings of far more ancient and mighty civilizations, impelled outward in concentric waves from the unfathomable center of the universe, themselves fleeing some monstrous doom, seeking new worlds on which to settle, driving before them the rooted inhabitants, in turn to fall upon the denizens of suns and planets farther away, like beating tides roaring out from a central convulsion of ocean.

WHEN, in 3241, the crab-men of Betelgeuse poured in a hundred thousand ships upon a beleaguered Earth, the nations were prepared. Atomic guns belched wild disintegration, brought the invading vessels down by the thousands. Flame guns seared and burned with extinguishable fires; men fought and died bravely in a thousand unknown battles against monstrous Crustacea, whose

knobbed antennæ crackled with green death. There were billions of them, spawning incredible multitudes more, even as they fought. Down into the prepared depths the Earthmen retreated, leaving the surface to the triumphant crab-men of Betelgeuse. There they were safe, temporarily, while the aliens swarmed over the planet and swam the seas.

But allies arose to aid the cowering people in the sunless depths. The lowly fungi and molds found the tender flesh of the Betelgeusans, underneath their armored carapaces, an ideal base for growth. Soon a destroying plague burrowed deep into the helpless aliens, smothered them in a mesh of sucking, growing rootlets. When the Earth people finally ventured to the surface, not a Betelgeusan remained alive. But two billion more humans had died in the invasion.

From the few captives, whose waving claws traced a geometric speech, the wild tales of the Rigellians were confirmed. The Galaxy was in convulsion. The Betelgeusans themselves had been forcibly dispossessed from their ancestral home, to seek safety and the conquest of a new world. The hordes of the universe were in flight, flowing outward from some mighty central doom, fleeing blindly, pushing the farther planets ahead of them, a tidal wave that would eventually lash against the outermost island universes. What it was that had started the mass hegira of planets and suns they knew no more than had the Rigellians.

The Earth nations knew now that other invasions were on the way. Only a bare half a million people had survived the two holocausts. With the grimness of despair they set to work to prepare against the inevitable day. The pitiful few were concentrated in strategic centers, close to the mouths of the great shafts that led down into the depths. An intricate signal system was initiated,

whereby warning could be sent around the Earth in a flash of light. The caverns were fortified, stocked with concentrated food; lakes were drained into them for water supplies, artificial lighting and oxygenation apparatus installed; the shafts were protected with impermeable shields and all the weapons that a feverishly active science could invent.

But when the attack came, in the year 3326, in spite of all preparations, the nations were caught hopelessly unawares. For the life forms of Antares were of a civilization mightier by far than either of the two former invasions. They came in individual shells of etheric force, at a speed far greater than the speed of the light waves that should have brought warning to vigilant Earth eyes of their approach. They came, not along the world lines of space time, but piercing through the warped curvatures of a matter-distorted space.

Thus it was that four hundred thousand died before they had even seen the purveyors of their death. By the time the signal could be flashed, a scant hundred thousand were able to dive into the depths of the Earth and close the ponderous locks behind them.

But the Antarians were possessed of weapons to which those fashioned by the scientists of Earth were puny toys. Even the shields of impermeable, of close-packed neutrons hailed as impenetrable to atomic disintegration itself, yielded eventually to dispersal rays that were tapped from a subspace.

Earth was doomed. Already the visor screens had brought sickening scenes to the huddled people of the New Mexico sector. All over the Earth, the Antarians had attacked the cavern deeps with relentless might. Lock after lock had been forced as they drove relentlessly down the shafts of a hundred havens of refuge. Subsector after sector had whiffed out in a blinding flame of extinction, so dazzling that the visor screens sizzled and crackled with the

pallid simulacrum of their destruction. Then a blank grayness covered the moveless surface, as the victorious Antarians destroyed all connections.

When the last screen went blank, a groan of tortured anguish burst from the pitiful thousand in the New Mexican subsector. They were the sole survivors of a once vivid, swarming race—a scant thousand out of the teeming billions who for æons and æons had populated the planet Earth.

## II.

GARTH ANDERS clenched his big, hairy fists. His dark, heavily bearded face knotted with straining muscles. His eyes glowered at the sole remaining visor screen. "We're through, finished," he groaned. "We're still alive only because Allan Hale's in command of the third lock. And they're beginning to break through now." He whipped savagely away from the screen. "I'll be damned if I'm going to stay down here like a coward any longer. Allan and his men are up there fighting, sacrificing their lives, while I—"

The girl turned her horror-stricken eyes from the telltale screen. Her pallor accentuated the delicate lines of her face. She had seen sights it was not good for a woman to see, and all about her the shadow of impending death lay heavily on the tortured countenances of her people.

"You will stay, Garth," she said decisively. "Allan ordered it so, and he knows best. No one can accuse you of cowardice. Allan has enough men to man the shield; more would only get in each other's way. You're in command of the reserves here, in case"—she hesitated, and for the first time her voice quivered—"in case they break through the fourth lock."

The big man swung on her. "In case?" He laughed harshly. "You know damn well they'll break through.

They've done it everywhere else. Allan's flung himself against them as a last gallant, hopeless resort. They'll blast through the impermite and smear him as they've smeared the whole Earth."

Kay Dorn shrank from the man's brutal candor, every nerve tingling. Her face drained of what little blood had remained. Her eyes clung in dreadful fascination to the visor screen. The great cavern was silent. All eyes stared with desperate intentness at the tremendous struggle that was raging five miles up—five miles of solid intervening rock. Only one man in all the throng did not watch, did not seem even to realize that his fate depended on the outcome of that last futile stand.

He was as remote from the utter despair that crowded around the tele-visors as though he were on another planet. He sat in a crystal chamber that made a sheathed bubble at the farther end of the underground shelter. No faintest noise, not even the shattering detonations of nitrobryl dust, could penetrate his soundproof fastness or disturb his concentration. Sheets of fibroid paper littered the flat desk before him. He was writing, steadily and evenly. Not for a moment did he pause for thought. When one sheet was covered with strange symbols, he added it to the steadily growing pile, commenced a fresh one, still at the same even pace. To one side was another flat table. On it were miniature models of fantastic design, intricate, lovingly built, like nothing that Earth had ever seen before.

The occupant of the crystal room was long past the prime of life. His thin, ascetic face was lined with the wrinkles of age. The hand that guided the stylus on its endless task was slim and finely veined. The sparse hair that thatched his skull was snow-white. But his eyes were strangely youthful, and their glance was calm and unafraid.

Out in the huge cavern the screen

dazzled and blared with sound. The titanic combat above was reaching a climax. Only fifty of the original hundred defenders still crouched behind the impermite shield. A tall, blond young man was their leader. His face was black with the dust of disintegration, but lips and eyes grinned infectiously. He was a whirlwind of activity, cheering on his fainting cohorts to greater efforts. Narrow slits opened and shut in the impermite shield in flashes of thousandths of a second. Automatically synchronized, flame guns and atomic blasts ripped destruction through the momentary openings, cut great swaths through the close-packed hordes of Antarians above.

But the shield was steadily growing thinner. Invisible dispersal waves lapped against it, pressed the neutron orbits farther and farther apart, ate through the lessening thickness with slow but remorseless strides. And every so often a beam would synchronize with the quick whirl of the slits, and blast atomic gun and defenders alike into a blaze of flaming ruin.

A GREAT WAIL arose from the straining watchers. The last weapon had just flashed into extinction, and with it all of the outpost but Allan Hale and a scant dozen. The impermite shield sagged, bellied inward—a paper thinness of futile defense.

Kay Dorn clapped her hand over her mouth to stifle the welling scream. Garth glowered at her bitterly. She loved Allan, the reckless, the smiling. While he, Garth, who would have gladly died for her, was but a friend, an elder brother—old enough almost—his bearded mouth twisted crookedly—to be her father, For a split second a wild, insane hope lashed through him. If Allan Hale, his own best friend, died up there, perhaps Kay, in the few hours or days left them of life, might—

He grinned again, a grin that was filled with hate for himself. "You love

him, Kay?" His voice could be oddly gentle for such a hulk of a man.

She tore her clinging eyes away from the screen. "I would not survive him," she answered simply.

He swung away with a bull-like roar. "Reserves!" he shouted in stentorian tones. "Follow me!"

Two hundred men stepped forward unhesitatingly. They and the defenders of the fifth lock were the last of the man power left to a denuded Earth. The others in the cavern were the old, the halt, the women and children.

"Where are you going?" Kay asked. "To reënforce Allan."

The men exchanged quick glances. It was suicide. Already the impermite shield was bulging alarmingly. Once it burst— But no one held back. Conite disruptors were gripped in steady fingers.

The girl swayed forward. "No!" she whispered. "It is madness. You could not help—and you would join his fate. You are needed, Garth. The fifth lock—the very last—"

A woman shrieked suddenly. "Too late! My Lord! It's too late!"

The screen was a blaze of blinding madness; the hollow cavern echoed with thunderous blasts. The impermite shield had vanished; the great shaft was a dark flood of descending Antarians; and nowhere was there any sign of Allan Hale, or of the few who had survived with him to the last destroying shock. Then the screen went blank.

Garth's eyes went blindly to Kay. She had not moved, had not uttered a sound. Nothing seemed to have changed. Through the man's pain-shot grief for his friend was a curious streak of semi-gladness. Allan Hale had been his rival. But the deadness in the girl's eyes slapped him back to realities. For him there was no hope—now or ever. Poor Allan had died in vain. He, Garth Anders, was now in command. On him devolved the last hopeless fight, the last

desperate staving off of the inevitable. Well, it did not matter much any more.

But a blaze of anger surged out at the sight of that calm, white-haired man, still bent over his curious calculations within the inviolable sanctity of the crystal bubble. He had not even raised his head at the concussions that had shaken the cavern with earthquake intensity; he never once had looked in the direction of the fatal screen. Damn Peter Loring with his futile scribblings! For the past month he had immured himself in that hermit shell, unmindful of the fact that Earth was a shambles, that soon the Antarians would break into this last stronghold and eradicate all traces of the human race—including himself.

True, he had invented the impermite shields that had staved off the invading hordes this long, but that was over. Instead of fiddling with figures and toy models of outlandish design, why didn't he reënforce the shields, suggest ways and means to overcome the Antarians? He had been the dean of Earth's scientists, the greatest mathematical physicist of them all.

Something had evidently sapped his courage. The dispersal waves of the Antarians, perhaps. Their scientific weapons, so far in advance of anything he could hope to fashion. He was an old man, but he should not have retired into his tower of silence to scribble academically. Writing his memoirs for the delectation of the Antarians, Garth thought sarcastically. A lot of good *that* would do! It was a man's duty to fight to the bitter end, even though the result were certain. Allan had done so, up there at the fourth lock.

Yet Allan had always stopped his grousing over the futility of Peter Loring with that queer, infectious grin of his. "Let him alone," he had said. "He knows what he is doing. He can't lick that dispersal ray. We're a million years behind the Antarians in knowl-

edge. It's our job now to hold them off as long as possible."

And now Allan was dead, and Kay was as good as dead. He had seen the soul die in her eyes. Well, it didn't much matter. Soon all of them would be little grains of blazing dust. But he'd die fighting. He reached over, twisted the dial on the visor screen with a big, hairy hand. It flashed into new life. The fifth and final, lock sprang into being. A slender company of men, a bare hundred, crouching behind the impermite, swinging their guns feverishly into place, their faces grim with the shadow of on-rushing death. Beyond the shield thousands of Antarians, each incased in his etheric shell, were dropping with breathtaking speed.

Garth whirled on his men. "We're no good here," he roared. "Up there at the fifth lock is our place. Come on!"

They answered him with an eager shout. They were of good stock, these last Earthmen, picked for special qualities. Even their women restrained their emotions, ironed out their deathly pallid countenances.

THE MAGNETIC LIFT stood waiting. Garth flung a last look at Kay. She was staring straight ahead, without life, without motion. With a groan Garth jerked toward certain death. But, even as he did, the lift suddenly whirred into motion, shot upward with lightning speed into the shaft.

The black brow of the man grew even blacker. Had the defenders quailed; were they preparing even now to abandon the lock without a fight? But the screen showed the lock still intact, the men still at their posts. Already the guns were blazing through the rapidly opening slits at the hordes on the other side.

Garth was bewildered. Then who—what— There was a whir, a flash, a swift deceleration, and the lift was back in its cradle. Figures stirred on it—

blackened, unrecognizable figures. They stepped off, dragging something shapeless among them.

An incredulous cry burst from some one's throat—a cry compounded of unbelief and flooding joy. It was Kay Dorn, suddenly released from frozen immobility. She darted forward, arms outflung, her voice a great sob.

"Allan! You are alive!"

"No reason why I'm not," answered the blackest, the most disheveled of the figures cheerfully.

The next instant Kay was in his arms, unmindful of dust and soot, unmindful of everything but that he had been miraculously restored to her. But the others were not so forgetful. They clustered around the six Earthmen, clamoring, exclaiming, crying out their wonder. Garth shouldered through the throng, wrung Allan's hand. Now that it was over, he realized what his friend's supposed death had meant to him. Then his quick eye caught sight of the thing they had dragged from the lift with them, and a gasp of astonishment burst from him.

"By the nine gods of the universe, what is that?"

Allan disengaged himself gently from Kay's clinging arms, grinned. "Just an Antarian who was rash enough to come through the shield before his fellows. We brought him along as a souvenir when we ran for it."

The alien from a far-distant sun stood incased in his shell of etheric force, proudly aloof, openly contemptuous of these primitive beings who through sheer mischance had managed to capture him. The Earthlings crowded around him with mingled wonder and bitter hate. None of them had ever seen any of the invaders at such close range.

There was indeed much to wonder at. The Antarian was a gelatinous cylinder, formless, featureless, without arms or legs or other appendages, glowing bluely with an inner phosphorescence. Feature-

less, that is, except for a spherical protuberance above, from which two knobs projected. The dispersal waves, all the mighty, destructive forces of which they were capable, flashed from those knobs, tapped by an inner body alchemy from subspace itself.

The wonder gave way to low growls of rage. The growls rose, were caught up by a thousand throats, changed ominously to shrieks of hate. "Kill him! Blast him down! Damn him and all his kind!" Sinewy fingers tightened on conite disruptors, hand flame guns. A hundred wicked orifices trained on the alien captive.

Allan lashed forward, thrust himself between the Antarian and the furious Earth people. "None of that!" he announced grimly. "He's my prisoner, and he's not to be harmed." He swung on Garth. "Here, Garth, you take him in charge. Bring him up to Peter Loring. He asked me to get him a captive—thinks he can clear up certain points if he can get him to talk. And," he ended grimly, "Peter will make him talk."

"But it will take weeks, months to establish a mode of communication," Kay cried. "By that time——"

"I think not," Allan interrupted cheerfully. "Besides, the fifth lock still holds, and"—his face hardened—"it will have to hold for at least another month."

"Here, where are you going?" Garth demanded suddenly.

Allan was already halfway to the lift. "A commander's first duty is to be with his men," he said quietly.

In three long strides Garth was at his side, his huge hand clamped on his friend's slender shoulder. His bearded face was screwed into a terrific scowl. "Your place is down here with Kay, you damn fool!" he growled. "You've done enough already. I'm going up."

"Insubordination, huh!" Allan rasped,

struggling to release the bearlike grip. "I tell you——"

Garth flung him backward with a mighty shove. "Hey, stop that!" Allan shouted, righting himself and running forward. "I command you——"

IT WAS too late. Already Garth was on the lift, shooting upward in swift acceleration. He was grinning sourly, his finger wagging at his nose in unmistakable gesture.

"Damn him!" Allan stormed helplessly. "It's suicide up there."

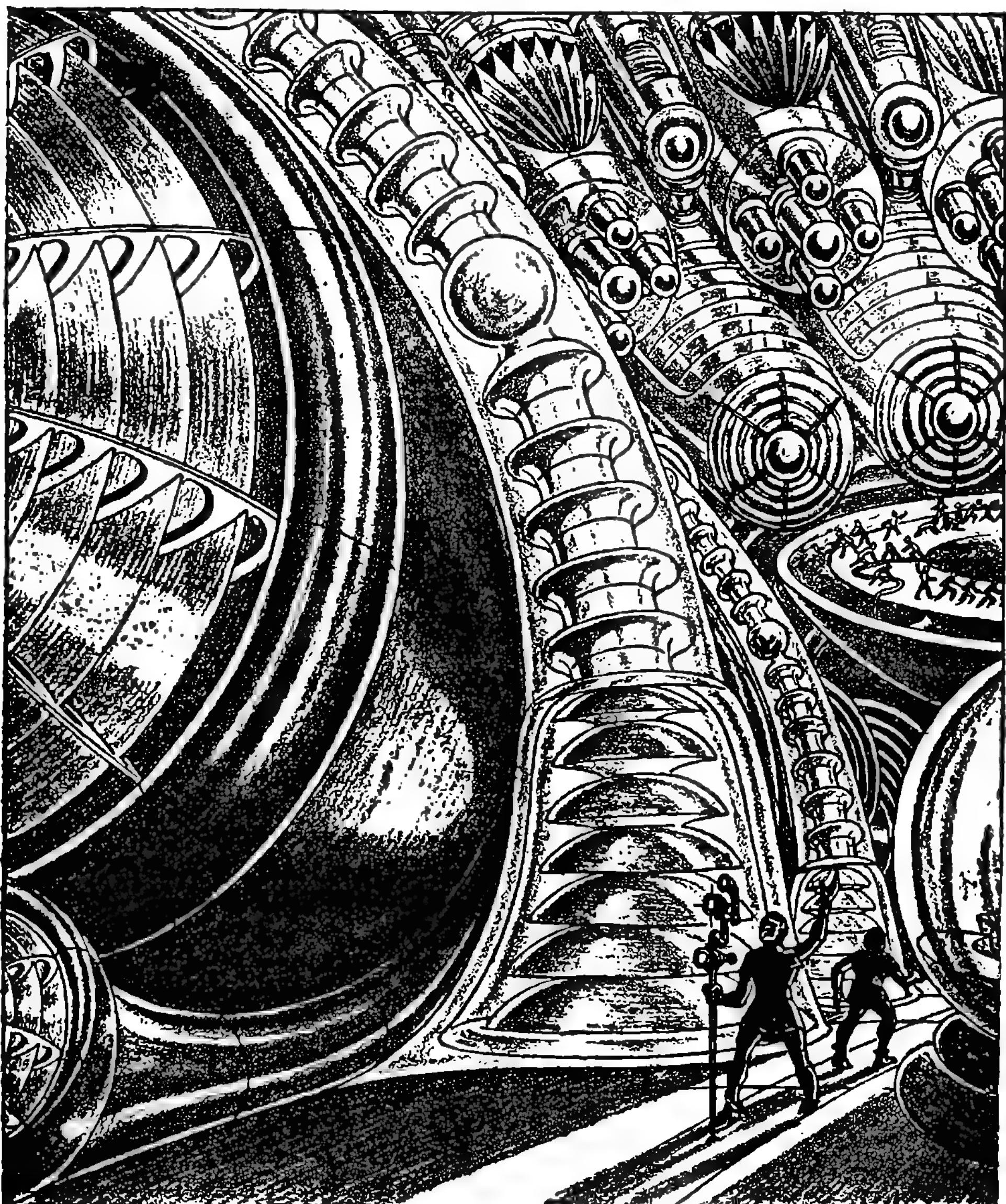
"It was suicide for you as well," Kay said quietly. A stab of pain for the older man pierced her heart. Poor Garth! She knew why he had done it. A gesture of sacrifice, for herself as well as for Allan. With a woman's sure intuition she knew of his hopeless, unuttered passion.

Still grumbling, Allan turned back. There was nothing else he could do. The lift was the sole method of physical communication with the shaft. He gave Kay's arm a quick squeeze; then his eyes narrowed. There was much to be done. Perhaps Garth had been right——

His flame gun gestured at the Antarian. "Get moving," he ordered briefly. The words meant nothing, but the gesture was obvious. The alien cylinder, ringed in by hostile men, had shown no alarm, no sign that it realized its danger, except for a certain deepening of the blue phosphorescence.

Now it floated forward, a foot above the ground, moved by internal forces in the direction in which the gun had pointed. Allan followed watchfully, Kay keeping even pace with him. Straight toward the crystal chamber they went, up to its gleaming wall. Peter Loring still bent over his sheets, still writing furiously, seemingly not even aware of their presence.

Allan grinned widely. "Good old Peter!" he ejaculated. "Not even the



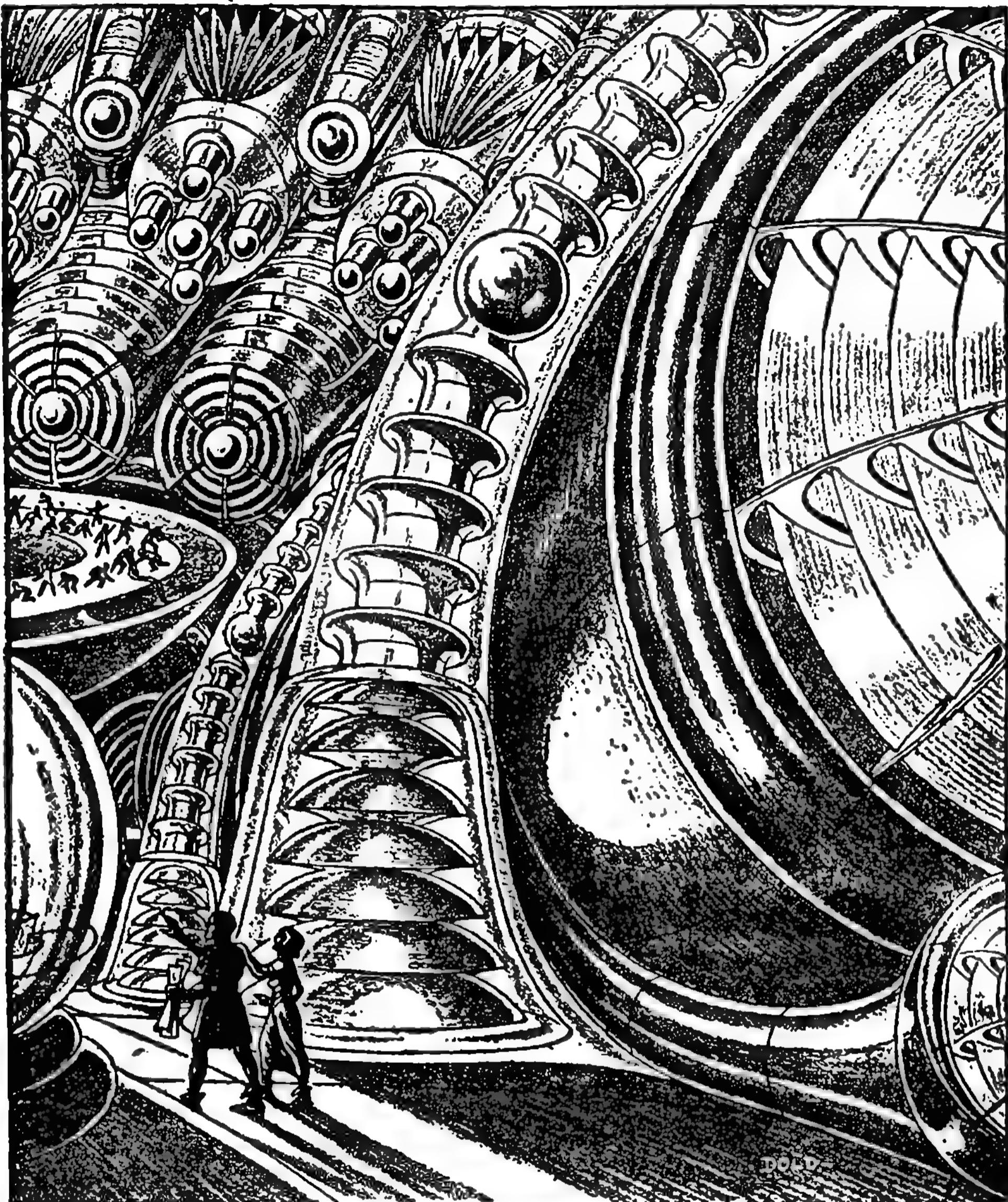
*Within the circle a cupped platform reared—vast enough to hold the few remaining people of Earth.*

collapse of the universe could keep him from his equations."

"But what good are they now?" Kay demanded with faint scorn. "In a short while both he and his equations will re-pose in equal oblivion."

Allan shook his head. "I don't know," he confessed. "But when Peter Loring asks for uninterrupted quiet, I won't stand in his way—even though he didn't take me into his confidence. The only time he was to be interrupted, he said a month ago when he entered the chamber, was to bring him a captive Antarian. Well, I've brought him."

He pressed a button embedded in the



wall. But even as his finger jabbed forward, Loring's stylus stopped racing, his head jerked up, and a flame of exultation enwreathed his ascetic countenance.

"He just solved something," Allan murmured. The signal buzzed inside, jerked Loring's head farther around. His eyes glowed on Allan, on Kay, blazed at the sight of the motionless prisoner. His thin hand stabbed downward.

### III.

A CRYSTAL PANEL slid open. They entered, and behind them the panel closed noiselessly. Loring rose, shook their hands cordially. The Antarian floated quietly to one side, close to the models. The blue glow pulsed rapidly in his body, as if here, for the first time, this inheritor of a mighty, alien civiliza-

tion had found something to excite his interest.

"Welcome, my friends," the old scientist greeted them. "Allan, my boy, you've done wonders. I asked you for a month of warding off the Antarians, and it's a month almost to the day. I asked you for a prisoner, and you brought him along." He glanced fondly at Kay. "You're a brave girl," he said gently. "I knew your father well. He was a good chemist and an honorable man." He turned back to Allan. "I *think*," he continued slowly, stressing the last word, "I've found something. Now if you could promise me another month of time——"

Allan answered confidently. "A month? A month and a half if you like."

Kay shot him a quick look from under long lashes. She knew that Allan's placid tones covered an inner despair. A month? Only the fifth lock stood between them and the end. The fourth impermeite shield had blasted away in exactly two weeks.

But Loring rubbed his thin hands in satisfaction. "Splendid!" he exclaimed, all unknowing. "That will be just about enough time. Look, my boy!" He picked up his final sheet, thrust it almost under Allan's nose.

Allan stared at it, shook his head with a grin. "My math ended with matrix mechanics," he said. "The schools teach no further. I don't recognize a single one of those symbols."

"Of course!" Loring seemed somewhat abashed. "I forgot you wouldn't know, that no one would. I invented these symbols myself, within the last month, to express something that not a single mathematician had even thought of in all the history of mankind."

"And that is——"

Loring thrust the sheet back on top of the pile. "Allan, Kay," he said impressively, "for over five thousand years mathematicians have been following a

will-o'-the-wisp, a false gleam. Even the matrix mechanics, the summation, seemingly, of all knowledge, of the universe itself, has been wrong—wrong from beginning to end."

"What's that?" Allan leaned forward, stared at those strange symbols again. He was genuinely startled. In fact, had it not been for his utter trust in Loring, in the knowledge that he had been Earth's foremost thinker, he would have laughed aloud in amusement. All his life, all the innumerable lives before him, mankind had held fast to one solacing thought. That, in a world of mutability, of change, one thing was changeless, perfect—the noble structure of pure thought that the mathematicians had reared. Old Peter Loring himself had so taught in the schools where Allan had first made his acquaintance.

The old scientist smiled. "I would have been as much surprised myself a few months ago," he acknowledged. "But this last invasion of Earth set me thinking. Something is happening in the depths of space, something that has set innumerable worlds in motion, fleeing from an inner, dreadful calamity. What is the nature of it? So far we haven't been able to find out. Our fathers questioned the Rigellians; I, as a young man, helped examine the crab-men of Betelgeuse. They did not know, either. But the fact remained that they had been dispossessed from their planets by repeated waves of invasion, a tide that rolled outward from the very center of the universe in resistless flood. What had started the inner denizens in motion; what had compelled them to swift flight? What had made them leave their ancient homes, the seats of mighty civilizations to which the Antarians themselves are far lower in the scale of evolution than we to them?"

Allan laughed dryly. "A rather academic question now, I'm afraid."

"Not at all," Loring retorted with some warmth. "For this academic ques-

tion led me, by logical steps, to reëxamine afresh the fundamentals of our mathematics—that mathematics by which we have hitherto been well able to explain the universe in which we live, even space time itself."

"And you found—" Allan prompted.

"That the fundamentals are imperfect, incomplete. In a sense this was recognized as long ago as the nineteenth century, when Riemann and Lobachevski reëxamined the axioms of Euclid, upon which all geometry had been built, and discovered not only that they were incapable of proof, but that other and equally logical geometries could be built on entirely different sets of axioms. But they went no further, and no one has done so since. For their geometries, including that of Euclid, satisfied the visible, tangible universe of their senses and instruments, and they were content."

KAY moved impatiently. This was arid, profitless discussion. Why didn't he seek the information he desired from the prisoner? Perhaps there was a way of circumventing the invaders. But old Loring seemed to have forgotten the presence of the Antarian. The blue cylinder in its shell of force had drifted over to the table, was quivering over the sheets with oscillating rays. Kay knew the aliens could see, in spite of their lack of human sense organs. Doubtless etheric waves, of a far greater range than in the case of man, were translated within their jellylike interiors into clear perceptions.

"When that remarkable ancient, Isaac Newton," Loring continued, "discovered the infinitesimal calculus, mathematics commenced its real upward climb. The theory of infinitesimals, and its converse, the theory of integration, have been the basis of all our present science, all our present knowledge. It seemed to fit the universe perfectly, to explain, to

prophesy even, before experimentation could catch up with the equations of the mathematician. But what, after all, is the real basis of the calculus?"

The young man grinned. "You are not very flattering," he commented. "I had to know that before I could even come near your courses. The theory is simple. It deals with continuously varying magnitudes approaching a limit."

"Is that limit ever reached?" Loring inquired.

"Technically, *no*," Allan admitted. "But actually the infinitesimals come so close to totality that the differential is smaller than any number or magnitude known to man."

"Exactly." Loring nodded. "So man has argued, and so he has reared his impressive structure of mathematics. But the foundation is insecure. For this differential, no matter how slight, is still an entity, and, being an entity, prevents all mathematics based on the calculus from being completely accurate. Just as the geometry of Euclid was shown to be very slightly off when relativity and the electron were discovered."

"But the geometric aberration has been known for many centuries," Allan declared in some bewilderment, "whereas all our progress, all our knowledge of the universe, based on the underlying theory of the calculus, has been proven time and time again to be absolutely accurate as a weapon of analysis."

"And so did Euclid's geometry," amended Loring, "in the days when man's measurements were confined to the comparatively short distances of the solar system, and to particles no smaller than the atom. When his range extended to the island universes on the one hand, and to the interior of the atom on the other, the defects of Euclid became glaring."

"But how does that affect the calculus?" Allan protested.

Loring smiled. "We've widened the

range again sufficiently to find its margin of error, also. As a matter of fact, the twentieth century had the facts in hand, but didn't realize their implications. That century knew that the universe was exploding, that it had started from some inner primordial atom of gigantic size, that, as it expanded, it created space time out of whatever lay beyond. The telescope of the twenty-eighth century actually penetrated to the blank wall of nonspace and nontime."

"And the calculus with its superstructure of vectors and matrices explained every detail of the expanding universe," Allan declared triumphantly.

"Exactly," Loring admitted with a little smile. "Because the universe was, as we knew it, a magnitude varying continuously toward a limit never to be fully reached. The mathematics fitted the imperfection of the universe. But now we have reached the limits, both ways, and the calculus of variables no longer applies."

Allan stared. "What limits are you talking about?"

"The outer nonspace, nontime on which the exploding universe is always encroaching, yet never engulfing, and the inner core of the explosion. The latter was always implicit in the theory, yet no one ever saw it. For, when the primordial universe atom exploded, its matter thrust outward in all directions. During the billions of years that have elapsed since the initial push, a gigantic central sphere must have been created, free of all matter.

But we know that space time does not exist without the presence of matter, even as it does not exist outside of the rushing nebula. Hence, the universe is only a mere shell, with totality within and totality without. Only inside the shell is there matter, space time, restless change. And *that*," he ended calmly, "explains the vast outward rush of the peoples of the inner suns. They are being swallowed up, sunk without a

trace in the nonspace time of the inner explosion. My calculations prove that the inner process is accelerating, gathering speed in a geometrical progression, while the outer shell is attacking the outer nonspace time in the order only of an arithmetical progression."

"In other words," Allan contributed dully, "not only we are doomed, but the universe itself is doomed. The force of the inner explosion will gradually eat through the matter and space time of the universe until it joins the outer nothingness."

Kay shivered. "Then what are they all fleeing and fighting for?" she exclaimed. "Eventually the explosion will catch up to them."

"It may take another million years," Loring explained, "and the lust for life is strong. But," he warned, "it's theory. That is why I wanted to capture an Antarian. Only a race that could travel faster than light could know anything of what is taking place at the core of the universe. For the explosive impulse is now of the order of a million miles a second, and accelerating every second."

"But how will you communicate with him?" Kay demanded.

"I've been observing the invaders in a special magni-visor I constructed," the scientist replied. "I've prepared a way." He strode over to the second table, picked up a metal hood of silver transparency.

SO ENGROSSED was the Antarian in that last sheet of equations that he did not notice the approach of the Earthman until the hood had been suddenly thrust over his knobby head. He straightened quickly, jerked away from the desk, his gelatine form blazing with lightning flashes of blue.

"No, you don't," Allan rasped warningly, as, through the transparency of the thin, unknown metal, the two knobs of the Antarian quivered and crackled.

His flame gun was trained directly on the alien. In all the discussion he had never once permitted his eyes to waver away from him. Swift death was in those knobs.

The Antarian understood; again the protuberances collapsed. Then, suddenly, upon the silver surface of the hood, sounds seemed to condense, and a metallic Earth speech poured forth.

"I had not expected to find any of the primitives inhabiting this world to be so clever," the strange, grating voice admitted grudgingly. "You have copied, a bit crudely, it is true, the thought helmet of the scientists of Antares."

Allan lowered his gun in his astonishment.

Kay cried out: "He speaks—our tongue!"

The cylinder of blue flame inclined toward her. "Not at all," the transparent hood remarked. "My thoughts condense on the radioactive substance of which this hood is composed, and are transformed into sound. Your fumbling scientist, from mere observation alone, was able to fathom its composition, to regulate the vibrations so that the electromagnetic thought impacts set in motion the sound waves of your own type of speech. The converse is also true. Your explosive little noises, impinging on the helmet, create the necessary ethereal vibrations that constitute the subtleties of our thought."

Peter Loring leaned forward, eyes aglow with excitement. "We are wasting time, being of Antares," he said. "Is it true that your race is fleeing the devouring nonspace of the central core of the exploding universe?"

The blue flame flickered, died momentarily, glowed again, as if with surprise. But the voice of the helmet was as flat, as mechanical as before. "You are indeed a superior order of an inferior creature," he declared. "It is true. We barely escaped with our lives. Had it not been for our method of space-warp

transection, we would have been caught in the annihilation of Antares and the planet on which we lived; for the expanding nonspace time was traveling far faster than light itself."

"Good!" Old Loring rubbed his hands in utter satisfaction. "If that part of my theory is true, then the rest follows."

"Your calculations interest me," resumed the Antarian. "They seem vaguely to point to some goal I myself have been driving for. But I do not understand all of the queer symbols you have employed. If you will transform them into sound, the helmet will translate them into intelligible thought for me."

The Earth scientist shook his head decisively. "You ask for more than I care to tell," he said quietly. "Your people have come as enemies, not as brother members of a common universe, bound together by a common doom. You have destroyed and slain; you wish to wrest our poor world from us for the remaining years of existence before the inner explosion overtakes us all. I shall say nothing to further your conquests."

ALLAN squeezed the trigger of his gun. He had been watching the Antarian with hawklike eyes. There had been a sudden quivering of those dim-seen knobs under the transparency. In a split second death would have leaped out at them all. But in that instant flame spurted in a long, thin stream. It splashed against etheric envelope, ripped through in a blinding flash of fire. The Antarian swayed, a red, fiery blaze, crumpled to the crystal floor in a spatter of dust.

"I had to do it," Allan explained regretfully to the others. "It was our lives or his."

Kay hid her face in her hands. "What a cruel universe we live in!" she cried brokenly. "It is kill or be killed—here

on Earth, in the farthest reaches of interstellar space. Everywhere is struggle, ruthlessness, brutality, the law of tooth and fang and claw. Life itself is a disease."

"You are right," the old man said softly, his eyes shining. "Life partakes of the nature of the universe in which it is entangled. It is imperfect, evolving toward a perfection it can never attain. That is why, as long as the universe exists, there will be pain and envy and suffering and torture."

"That will soon come to an end," Allan commented dryly, "if your calculations are correct. Then, extinction, the Nirvana of the ancient Hindus."

"Yes, Nirvana!" Loring said strongly. "But a different Nirvana from that which you contemplate. For perfection *does* exist, and I *don't* think it means extinction."

"Perfection?" Allan repeated incredulously. "Where? You yourself said it was impossible in this universe."

"And I repeat it," the old scientist told him calmly. "But outside—in the nonspace time, beyond infinity itself, where matter, that strange disease, has never existed—*there* should be that perfection toward which the universe has restlessly expanded since the beginning of time, and, by its very nature, has destroyed in the vain attempt to reach."

"Riddles!" Allan retorted a bit impatiently. Up there at the fifth and final lock Garth Anders was waging the last hopeless fight, and he, Allan Hale, the titular commander, was discussing fruitless abstractions and a mystical philosophy while their world was crashing about their ears.

"Not at all," the aged scientist answered equably. "For in that present nonexistence beyond the universe of things is our salvation—more, the unimaginable perfection toward which our race has climbed these long, weary aeons."

Kay uttered a little gasp. Allan

snorted. Poor Peter Loring! His vast brain had finally snapped under the terrific strain of their approaching doom.

"Of course," Alan remarked, with thinly veiled sarcasm, "it is a mere nothing to transport us to that place of non-existence, where infinity itself has been left behind. And, of course, our poor, material, space-time-bound bodies will find that nothingness capable of sustaining life."

Loring did not seem perturbed. "You are quite right," he replied slowly. "I have found the means of transportation. The answer lies in these final equations, and in a certain extension of those models I have fashioned. The Antarian, with his superior mentality, recognized the fact that the solution was there. Given time, he would have unraveled the riddle of the unaccustomed symbols. Had he been successful in eliminating us and escaping to his fellows, the Antarians would then have been the only race in all the universe to reach the ultimate goal. Now it will be the remaining people of the unimportant planet, Earth!"

Allan stared down at the strange equations. He remembered the Antarian's behavior. Perhaps old Loring was not mad, at that!

THE SCIENTIST tapped the sheet with his stylus. "This," he continued, with a certain pride, "is the new, the final mathematics. I started where the calculus left off. I investigated the properties of the last differential, that tiny differential which the calculus proclaimed so infinitely small as to be disregarded, and erred in so doing. I have fashioned a new calculus—the calculus of the totality. Those equations represent the end result. They represent not only what may be termed the 'beyond infinity' element of the universe as we know it, but also the 'beyond infinity' element, the totality, of ourselves, of our machines, of every speck and grain of



*Still pumping disintegration blasts toward the fissuring shield, Garth sent Allan sprawling back upon the magnetic lift.*

dust, of every electron that ever existed.

"For the first time since Schrödinger discovered the strange wave-particle nature of matter, with its unintelligible

positions of probability, a true explanation has been offered of the anomaly. In these totality equations, the probabilities, the indeterminacies, are gone. It will be a comparatively simple matter to build

machines based on these equations, to extend ourselves into the 'beyond infinity' trains of our constituent parts. Thus we may free ourselves forever from the limiting curse of our present selves, from the danger of eventual annihilation between the two infinities, both inner and outer. And," he went on with a little smile, "we shall escape the very present certainty of hastened annihilation from the efforts of the Antarians."

Kay's head spun. It was too much for her. But Allan puckered his brow furiously. The thought had penetrated. Yet one insuperable objection still clamored in his brain. "But what will happen to us in that strange place beyond the universe; how can we exist?"

For the first time Loring seemed to have lost his self-confidence. "I—I really can't answer that," he admitted hesitantly. "I can only hope that in the perfect state we, too, shall become perfect. I grant you," he added hastily, "that it's a wild chance; but—what have we to lose?"

That last phrase echoed and reechoed in Allan's brain. What, in fact, *had* they to lose. Inevitably, the Antarian hordes would break through the last impermeite shield. What mattered it—extinction beyond the universe or extinction ten miles beneath the surface of that Earth they would never see again? Something stirred within him. The unimaginable adventure of it; the strange voyaging to a place at the thought of whose very being the human mind reeled dizzyingly. Half-forgotten lines of a wholly forgotten poet ran in his ears:

This gray spirit yearning in desire  
To follow knowledge like a sinking star,  
Beyond the utmost bound of human  
thought.

His hand went out sudden, frankly. "Peter Loring," he said, "how long will it take to make ready?"

The old man's eyes kindled. Age seemed to drop from his stooped shoul-

ders like an outworn cloak. "One month."

"Then," replied the younger man steadily, "for one month we shall hold off the Antarians."

Kay looked at him with quick side glance. They had figured at the most on two or three weeks' grace. But, if Allan Hale extended the time limit, she rested quietly in the firm assurance that he could do it.

But it was not Allan who held off the irresistible alien attack. It was Garth Anders. That worthy listened in silence to Allan's rapid explanations, all his attention seemingly concentrated on the disruptor that shot blasts of disintegration through the rapidly opening and closing slits in the impermeite shield. Three hundred men had been stationed at the fifth lock; already fifty had died. The neutron barrier was inches thinner, slowly vanishing under the steady, resistless dispersal rays. Beyond the shield, the peri-visor disclosed the upper lift of the huge shaft, filled with the charging Antarians, each inclosed in his etheric shell, scorning all weapons extraneous to the deadly powers residual in their gelatinous forms.

Still higher, in the light of that Sun they would never see rise and set again, countless millions of the invaders had spread over the green Earth, were already establishing their cities, rebuilding their mighty civilization. This last mopping up of a few trapped Earthmen could safely be left to a single battalion of their kind.

WHEN Allan was through, Garth checked the synchronization apparatus carefully, screwing up his black-bearded countenance in a terrific scowl. Then he laughed, loudly, derisively, until the other sweaty, dust-embroidered defenders looked up from their interminable crouch in surprise.

"So *that's* the crazy scheme old Loring was wasting his time on this past

month!" he cried. "I might have known it." Then, suddenly, his irritating amusement fell from him. He was silent again, serious. "At that," he said in a lower key, "we're dead men here; might as well be dead men in the realm of nowhere. But," and he raised his head defiantly, "I'm staying up here in command, and *you* are going back to help Loring get ready. He wants a month, eh? Well, he'll get it. Tell him I said so."

They quarreled bitterly at that. Allan insisted it was his job to hold the lock, and Garth called him a fool and a numskull who couldn't be trusted against the wily Antarians. "Besides," he shouted, "Kay needs you." He grinned painfully. "We may all live only another month."

"Do you think," Allan said, "I'd permit my private affairs to interfere with my duty?"

Duty, hell! Garth groaned to himself. If Kay had loved *him*, he'd have let the whole human race rot rather than quit her side for an instant. But Kay loved Allan, not him—therefore—

He took another tack. His huge paw dropped on his friend's shoulder. "You're right, Allan. No matter how painful duty may be, we must obey its dictates. Now, I'm only a fighting fool. I'm good for blasting Antarians out of their shells, but for nothing else. I never could make head or tail of theoretical mechanics or the rarefied rot of matrices and what not.

"Old Peter Loring needs help and plenty of it—brain help! That's *your* job, Allan. I can handle this end as well as you; no one can handle the organization down below *but* you. Now, go on, get going." He shoved the still-protesting, half-convinced young man toward the magnetic lift. "My regards to Kay," he shouted as it whirred out of sight.

But his joviality left him as he turned back to the grim, hopeless defense be-

fore him. With sudden clarity he realized that he would never be one of those to take the great adventure into the unknown. He was going to die—here—fighting off the Antarians until the very last possible moment. A vision of Kay swam before his tortured senses. Very likely Allan would even forget to transmit those poor last regards. He laughed harshly, swung on his gaping men.

"Get back to your posts, you idiots," he shouted. "What do you think this is—a tea party? This is war—war without quarter. We're stopping those damned sons of an alien sun out there, and we know it. Come on, give it to them again!"

Once more the shaft resounded with shattering blasts, filled with the fumes of disintegration, blazed with eerie light. Another gun exploded as a purple beam lashed through the whirling slit. The crew screamed as one man, horribly—Then the black dust of what had once been men settled in a thick cloud on the heads of their comrades. The lock was an inferno of sight and sound.

Beneath, the great artificial cavern galvanized into a fever of activity. Under the driving lash of Allan, encouraged by the cheerful, soothing words of Kay, the despairing remnants of a once-numerous Earth people pushed on to tasks of whose exact nature they were only dimly aware. But anything was better than the slow waiting for an inevitable end, and the name of Peter Loring still held its ancient magic.

Old men, women, even the little children helped in a frenzy of straining effort. Exploratory shafts dug deeper into the dense core of the Earth; manganese, iron, nickel, beryllium, titanium, uranium, radioactive metals, were mined out, flung into the huge electric furnaces, where a hundred thousand degrees of heat fused them into new and strange alloys.

The unimaginable pressure of col-

unns of volcanic magna was utilized to twist them into strange and fantastic shapes. Hyperbolic paraboloids, lituoloids, solid trochoids, curves for which no possible name could be assigned—wavering off into a seeming fourth-dimensional continuum—poured forth in endless profusion, obedient to the directions transmitted from the crystal inclosure to Allan, and distributed by him to numerous assistants.

#### IV.

NIGHT AND DAY they labored, in the interminable glow of the "cold light" tubes, while Loring tossed off endless equations with his unresting stylus, translated them into tangible models such as no man's eyes had ever rested on before.

And all the while Allan watched the visor screen with a gnawing, growing anxiety. The impermitem barrier was getting perilously thin. Only a scant inch of close-packed neutron elements remained to shield them from whelming destruction. The attack was growing in savage intensity, as the Antarians concentrated on the last frail barrier. A single flame gun, a solitary disruptor, remained to the battling Earthmen. The others had been blasted into fine dust. Of the defending force of three hundred, a bare fifty were left. And a week was still required for the final setting up of Loring's queer apparatus.

But Garth screwed up his dark, shadowed face more fiercely than ever, and drove his sooty demons on to superhuman efforts. "Another week is needed, you sons of disintegration," he roared, "and by the nine gods of the universe you'll give it to them."

To Allan's anxious calls, to his hurried visits and prayers, commands, even threats to take over the perilous post, Garth interposed lurid language. "Get below!" he shouted. "Get back to your job, and don't interfere with mine."

Day and night, night and day, the insane driving went on. Allan did not sleep—neither did Garth, nor did Loring. They were gaunt shells of their former selves. Kay sagged on her feet with brave weariness.

At last the cavern took definite shape and form. Huge reflectors of fantastic shapes and more fantastic alloys ringed the great round with shining, pointing surfaces. Gigantic machinery tapped the liquid veins that lay perilously close to the walls of the underground retreat, transmuted pressure and heat alike into electromagnetic stresses of unimaginable intensity. Within the huge circle of enringing reflectors, a cupped platform, curving to a hyperbolic function, reared itself from the stony ground. It was vast enough to hold within its embrace all of the pitiful few who were left of Earth's innumerable races, and it shimmered with a strange iridescence.

The old scientist straightened his stooped shoulders with an effort. He had aged terribly. The lines of his face were ravaged pits; his wrinkled skin hung in pouchy folds. Even his voice was a bare whisper. "Almost finished," he quavered. "Another half dozen hours of making the last connections, tightening, welding—and we journey forth into the unknown."

Kay supported his tottering frame with the last strength of her own infinitely tired arm. "We'll make it, Peter," she said with an effort. "You must rest now."

Allan groaned. "Six hours!" he said bitterly. "We might as well ask for all eternity. Look at the visor screen."

The impermitem screen was sagging, bulging inward in paper thinness. The solitary gun was silenced, sheered off cleanly at the middle. A scant dozen blackened demons crouched behind the bursting barrier, hand guns ready, waiting for the last terrific smash. Garth's mighty shoulder pushed against

the shield, as if to support it against the terrific dispersal rays.

Allan straightened grimly. His voice rose, crackled out swift orders. The weary people hurled themselves desperately back to their tasks—men, women, children.

To Kay, Allan spoke quickly. "Take over, dear. Get old Peter onto the platform, hustle the others on as fast as they're finished with their particular jobs. Every second will count. You know the master switch. Pull it, and pull it hard. Bye!" Then he was gone.

"Allan, darling!" The girl's voice was taut with anguish. She started after him, stopped. It was too late. Already the lift was speeding up toward the battle zone.

She turned blindly toward the scientist. He patted her shoulder. "He's a brave lad," he whispered. "Come, we must not let him down."

Garth Anders turned his black, suffering face toward the newcomer. "Damn you, Allan!" he howled. "You get away from here. Get back to Kay. I told you I'll keep the lock."

Allan grinned softly. "I know you did, old-timer," he said gently. "But six hours is a long time to fight alone. I'll keep you company."

Garth stared around in bewilderment. He had not realized that he was the sole survivor of the company. Three hundred men were dust and ashes—a black soot on the metal floor. Then he shook his head, grunted. This was like old times. Allan and he, shoulder to shoulder, fighting overwhelming odds with a song on their lips. Only this time, he grimaced painfully, there would be no way out. Both loved the same girl. They would die together. It was justice.

FLAME GUNS IN HAND, they crouched low, eyes slitted, trying to synchronize the blast of their triggers with

the still-revolving, evanescent openings. An hour, two hours, three. The shield was bulging in a great arc. In spots the layer of neutrons was so thin they could see beyond, see the interminable flood of Antarians, feel the spent energy of dispersal rays and annihilating death alike, as they wormed through the transparent layer. Four hours, five hours, five and a half. The visor screen crackled with desperate pleas from beneath. Hold them off a few more minutes! The last cables were being rushed into place. Already the old, the halt, and the children were streaming into the cupped platform.

Allan grinned. He did not know what a furious scowl it made. "We'll hold them," he said painfully. The neutron shield had cracked. Steadily, they pumped conite disruption in a solid blast at the openings. As long as the stream continued, the Antarians were at bay. But a split second's interval, an instant's halt in the steady flow, and the aliens would be upon them.

Their fingers froze to the triggers. The energy potentials were receding at an alarming rate toward zero. When that happened—

"I think we'll just make it," Allan said quietly to Garth. "They'll get away in time."

"And we?" Garth spat out.

Allan did not answer. But under his breath he muttered something. To Garth it sounded like, "Good-by, Kay darling!"

The big, bearded man edged stealthily toward him, still pumping disintegration blasts toward the fissuring shield. With a quick sweep of his left arm, he caught Allan a smashing blow across his chin, sent him sprawling headlong back upon the magnetic lift. With his foot he kicked back at the control lever.

Allan stumbled groggily to his feet, lurched forward desperately. But already the lift was accelerating. The last

thing he saw was the giant form of Garth, shoulders squared, hurling his empty, futile gun straight toward a rushing torrent of Antarians. The impermeable shield had blasted wide open. There was a roar, a searing flame—and Allan felt the bottom drop out of the world.

## V.

VAGUELY, he heard distant voices calling his name; in a whirling haze he felt his lagging feet propelled rapidly over hard ground. Then a dash of cold water, and he sputtered into awareness. He was within the cupping platform, supported by two men with the shadow of death on their countenances. All about him was a milling, wailing mass of people. Old Peter's voice was lifted, youthfully strong once more. "Quiet, every one! We have not a moment to lose!"

"Kay! Where are you?" The name burst from Allan's lips. He tore loose from the men who held him up, lurched forward.

Some one screamed. "They're coming!"

A great cry of dread went up from five hundred throats; there was a mad scramble toward the center—anywhere, to get away from the triumphant invaders.

The Antarians had descended the shaft, blasted the encumbering magnetic lift from their path, and were pouring into the cavern, each cased in his shell of etheric force, knobs quivering with blazing purple death.

Fifty Earth people puffed into flaming extinction at that first impact. Then a hundred whifflled into impalpable dust. More and more Antarians were dropping into the last underground shelter of the human race, glowing with fierce, angry lights.

"Kay!" Allan shouted again, thrust-

ing with swinging fists through the panic-stricken crush. Then he caught a glimpse of her—helpless in a wild rush, struggling futilely to gain the lever at the outer edge. A hundred more spattered into flaming disintegration.

Allan whirled, smashed his way toward the lever. He must get there before, before—

His fingers gripped, pulled.

There was a sudden cessation of sound, of sight, of everything. Cavern, terrified people, Antarians, apparatus, disappeared. A pearl-gray, unfathomable nothingness surrounded him, enveloped him in a warping shroud. He was everywhere; he was nowhere; he floated in an empty void; he was surging forward at a speed beyond the limiting speed of light, beyond any concept that the puny human mind could frame. He was alone, yet, somehow, the whisper of other forms—close by, or millions of light years away, he could not tell—interlocked with his being.

He was no longer matter, a thing of protons, electrons, and neutrons. He was somehow an infinite train of probabilities made substantial, reaching out along the rushing waves, elongating in terrific expansion. He was no longer a finite entity, hampered and restrained by an imperfect, limiting universe. He was totality, a mathematical calculus in which the last differentials had been surmounted and passed. He was greater than the universe; he was beyond it.

He did not know how he knew all these things. They pervaded his being with a calm, omniscient awareness.

Then, out of the vague formlessness, strange things began to coalesce and streak by in misty blurs. Rushing paths of light—white, yellow, red, golden fireballs—along the tracks of eternity. Mighty suns, his inner awareness told him, through which he was hurtling at a speed of thousands of light years per second. Then they, too, were gone.

OUT, EVER OUT, hurtling to the last confines of an ever-receding infinity, to the last warp that clothed the knowable in a cloak of majesty. Far behind, coalesced into a rounded shell, compressed into a single orb of undifferentiated light, was the universe of space and time. Then—the grayness glowed and pulsed in vast rhythmic beats, lapping him, urging him ever on. There was a flash that filled eternity—a violent, rending crash.

He had hurtled through the limiting barrier, had exploded into the outer non-entity, where space and time had not yet been born, where the spirit of non-being brooded and waited. He had passed the last differential. He was beyond infinity!

For what may have been an unimaginable fraction of a millisecond, or unimaginable æons of time—how could he tell where time itself did not exist?—he lay and felt the flow of strange vibrations through his being. He tried to orientate, to localize himself—and could not. Space did not exist. He was wherever he thought, and thought itself was now a limitless process.

Then thoughts interlocked. First, as faint whispering threads reaching tentatively toward himself; then they grew stronger and stronger, until, with a quiver of glad awareness, Kay had joined him. Not her physical body, but the thought processes that were hers. They slid along his being, spoke to him intimately, lovingly.

“Kay!” he cried voicelessly. “Where are you? Come to me! Let me see you.”

She must have laughed. “I am with you—now,” she answered. “Thinking your thoughts, interpenetrated. I doubt if we have corporeal bodies; I feel no sensation of one.”

“Nor I! And I!”

Other thought processes crept into Allan’s being. He recognized them—men

and women who had journeyed with them on that last tremendous journey beyond the limits.

“We have achieved perfection,” some one said joyfully. That was Peter Loring. “We are pure thought, the end-all of evolution. *That* is the secret of infinity. Matter, physical being, space time, are but momentary excrescences, diseases of an all-pervading thought. There, clad in limiting forms, we were tiny, struggling things, warped in thought as in space time, striving upward toward a goal we dimly perceived, but could never reach. Only as the expanding universe enfolded this outer thought into its being was life in any sense possible. But only beyond the universe could life divest itself of all impediments, leap at one great stride to pure essence, pure thought.”

Some queer, matter-bound entity within Allan rebelled at that. Old Peter Loring had long been on Earth the personification of intellect. Age and self-discipline had quenched the physical, the joy of body, of tactile sensations. It was all very well for him. In this limbo of eternal thought, he would be infinitely happy. But Allan? He had been young and vigorous; even in this vague state he felt the tug of half-remembered things: the feel of Kay in his arms; the warm pressure of her lips; the smell of new-mown hay; the deep intake of salt-sea air; the hard, firm, satisfying crunch of mountain trails; the gusty flavor of odorous foods; the pitting of muscle and brawn against resistant obstacles.

Thought was satisfying, the things of the intellect important. But they were not all of life. There were those other sensations as well, that gave the tang of variety, that made life what it was—a thing of struggle, of sorrow, of joy, of death even.

Regret sprayed through him. He should have fought to the end at Garth’s side. At least, in the last flame of annihilation, he would have achieved his

Earth destiny—not this pallid simulacrum of an extended, bodiless intellectuality. In a flash of clarity he saw the wisdom of the exploding universe. The Creator had done what he had with a true wisdom, a depth of understanding beyond the dreams of philosophers and mathematicians like Peter Loring.

Only in struggle, in upward evolution, in striving for a goal forever unachievable, could life find savor and gusto. Even in pain and suffering there were compensations. Suddenly Allan recoiled in bodiless horror from the thought of an immortality of pure, moveless thought, of interpenetrated entity, of emotionless wisdom. He wanted fiercely to see Kay once more, to behold her uplifted face. This bloodless interchange of thoughts was not for him. Perhaps in that last seething departure from Earth, some filaments, some probability trains of electrons, of protons, had not been cleanly severed, had left their impingements trailing back into the space-time continuum.

"I do not wish for this state," he thought deliberately. "I would rather be back in the universe of imperfections, content to suffer death and annihilation, fighting even the Antarians, than remain in this bloodless, endless staticism. Is there no way in which we can reverse the process, you who were once Peter Loring?"

Little quivering thrills shot along the interpenetrated skein of thoughts. There was Kay, quietly acquiescent. "Whatever you do, Allan, I am content." There were others, more timid, straggling in their responses. They hungered for their bodies, for the physical.

AFTER AEONS of waiting, Loring sent his thought. "It is impossible, Allan Hale. The process was irreversible. I have achieved my goal; I am sorry you others have not. You have carried your Earthly bonds along with you; even into totality."

The quivers grew; on Earth they would have been recoils of despair. Somewhere, in the void, Kay was trying to comfort Allan, to reach him with immaterial arms.

Allan said fiercely. "There must be a way. Otherwise perfection itself is less than perfect. If we have attained totality, then implicit within our beings are all things, even that wild universe of suffering and disorder from which we fled—and for which we yearn."

Again æons of waiting, while Loring pondered the problem. His thought was like the ghost of a sigh. "You are right, Allan. There *is* a way. But not the way you wish. You have evolved out of the old universe of space time; you cannot undo that process. The whole cannot shrink back into the part. But you can go on."

"Even from perfection?" some one cried.

"Even from perfection," Loring echoed with a wisp of sadness. "You may repeat what has been done before, an infinite number of times. Your former universe was not the first, and, because of your desire, it will not be the last. Totality contains within its womb the seed of new birth; of another universe that will commence afresh as a huge primordial bursting atom, and explode outward toward totality, again engulfing a shoreless infinity, until itself is once more engulfed by the accelerating force of the inner explosion."

"Now I understand the births and rebirths of new and ever newer universes. It had ever been a mystery before. Always, as life forms evolved, there were those who grasped the secret of escape from eventual annihilation. They, after æons of pure thought, grew restless, even as you, and willed into creation a new space time, a new matter, to commence all over the endless treadmill."

"But how may we accomplish this?" Allan demanded.

"Merely by concentration of your col-

lective thoughts. Was it not always suspected, from ancient Plato to medieval Jeans, that the universe was merely the creation of pure thought? What you *will*, must come into being."

"What about the still-existing universe from which we emerged?" Kay inquired. "Would there not be conflict between the two—a head-on collision?"

"Time," said Peter Loring gently, "has no meaning here. But in that temporary space time from which we came, a million million æons have elapsed. The universe you knew has already been swallowed up, made one with totality. That is why I said there could be no return."

"Let us waste no more futile æons of a time that does not exist," retorted Allan.

"First decide what type of universe you would will into creation," Loring said.

"The same as our old familiar space warp," answered Allan. "With all its imperfection, with all its insufficiency, we lived in it, loved and breathed and had our being. We would not be happy in any other kind of world."

Quivers of thought showed unanimous agreement. There was something else in Allan's mind. He wanted Kay back just as she had been, unchanged, adorable. In an experimental universe—

ATTUNED, their thoughts welled outward in mighty unison. It was an awe-inspiring idea. Thought—the concerted thought of a handful who had once been petty Earthlings—creating the majesty of a universe entire! Gods to whom the ancient deities of Greece and Rome had been but tribal localisms.

Totality quivered and moved with restless longing. The spaceless gray radiated into the essence of nonbeing. The viewless glow streaked with supernal fire. Thought itself rolled and coalesced on the weltering chaos. A universe was giving birth.

Again and again they willed. They were a storm center, a focus from which space time unwrapped in wide-darting unfoldments. The primal essence shook to the creative impact of their thought. Nonbeing whirled on its self and vortices were formed. The vortices moved and sent out infinite waves of probabilities. They acted and interacted on each other, merged into a gigantic globule of primordial matter, a single atom of monstrous size.

The atom revolved under the surge of united thought, slowly at first, then faster and ever faster. As it whirled, space time enfolded it in a spherical shroud. Light was born. The universe revealed itself in a luminous mist.

Faster! Faster! The periphery stormed around at inconceivable velocity. Gravitation was born; so was centripetal force. At the very core and center of the disturbance lay the immaterial totality of those who had been inhabitants of a forgotten, tiny Earth. Their thoughts surged forth in continued unison, willing the hurtling chaos into form and being. Around them, sheathing them, was still totality, "beyond infinity," a hollow non-space time in the heart of the sphere.

The bubble of the universe was unstable. Thought pressed it outward from within; the whirling outside swept up new space time with each wild revolution. It could not last.

There was a blinding explosion, a mighty outward surge of rushing matter. The tremendous atom had shattered. Universe and nonuniverse rocked with the impact. The exploding matter hurled itself forward with greedy avidity. Space time went with it. Nebulæ blazed into being, spiraled, coalesced into great suns. Within the central core, nonspace expanded, on the track of fleeing matter, like an unleashed hound after a rabbit. Slowly at first, unable to keep pace with the wild flight of the periphery, but gradually accelerating. A million æons would elapse before the inner ex-

plosion would overtake and swallow the outer. The eternal cycle of birth, exploding universe, annihilation, and rebirth had been once more established.

Within the central bubble Allan ceased his labors. "You have started the process of infinite recurrence." Peter Loring told him mournfully. "Nothing more is necessary. Stars are evolving; soon planets will whirl in their orbits. Imperfection, the disease of matter, will strive again toward perfection, totality, and never reach the limits. Evolution will take hold; oceans will form; carbon and its associate elements will stir into that strange, crawling colloidal compound known as life. Men will rise from the brute, seek knowledge with their finite brains, fight and love and die without a grasp of the universe entire."

A great wave of thankfulness interpenetrated the composite Earthlings. Perfection was not for them; this future that spread before them was *life*. They yearned toward it as to a frolic; they were impatient for its commencement.

"COME," said Allan. "Let us go! I see in that distant middle galaxy a red sun somewhat akin to that old Sun which shed benign rays on our former home. I see planets of diverse size encircling it. One, in fact, is spinning on its axis, lapped with life-giving waters, from which land has emerged. A thick blanket of atmosphere envelops it, even as once before an Earth had been. There, my friends, is our home!"

"It is too early," Loring warned. "The planet you have chosen is young and steamy. Wait until the waters have settled, and the barrenness is covered with developed life."

"We can't wait," cried Kay with infinite longing. She was weary of immaterial thought; she wished to feel the solid, substantial warmth of Allan's arms about her. Nor were the others less eager for their loved ones, to gaze upon their faces once again.

"Very well," Loring said resignedly. "I cannot stop you; I have no wish to do so. Go, and may you find your heart's desire in that perilous imperfection."

"And you?" Allan demanded suddenly.

"I shall remain," answered the former scientist. "I have not your desires, nor loved ones to console me for the loss of this infinitude of thought. I have reached the Nirvana, and I am supremely content."

Nor could the voiceless impact of their minds dissuade him from his course. At length, reluctantly, yet filled with an abounding eagerness for the great adventure on which they were anew embarked, they willed themselves toward that distant planet, their goal.

Along their trains of probability they fled, hurtling toward the universe of space time which they had created. Behind them, fainter and fainter, came the thought processes of Peter Loring, bidding them Godspeed.

There was a sudden jar, a shattering crash. They had burst through the warp of space and time, were now within the universe of matter. Behind them, snapped off by the resilient envelope, trailed their totality differentials, their "beyond infinity" elements. They were finite beings once again, coalescing along electron trains, ripping through the ether with a speed beyond the limiting speed of light, decelerating as they fled. Ribboned bands of light that were nebulæ foreshortened became recognizable galaxies; tenuous streaks of fire grew oblate, condensed before their slowing rush as teeming stars.

Slower, slower, breasting the increasing resistance of the space warp, already feeling the gravitational tug of a mighty universe, down to the limiting speed of light, down to hundreds of miles a second—swinging, at last, into familiar world lines, slacking their wild, still im-

material flight, until, just ahead, a red star glared at them; planets swam in steady orbits, and a certain satellite—not unlike that unforgotten Earth—accompanied by two silver moons, spread its blanketed bosom far beneath.

For a flash of thought Allan had a sickening sensation. What would happen to them as they reached the focus at the surface toward which they had willed their desire? Perhaps they should have waited, as Loring had suggested. What manner of life awaited them on this suddenly alien-seeming planet? Would he ever see the comrades of his tremendous hegira beyond infinity and back; would Kay be at his side?

Kay! Frantically, he tried to call her, to break his interminable drop. But space surrounded him now, and time, and the laws of matter, obedient to a differential calculus from which he was no longer emancipated. There was no answering thought—from Kay, from any one else. He was alone, a streaking immateriality converging on a focus in an alien universe. Terror overwhelmed him—terror and vain regret that he had not heeded the perfection that was Peter Loring. He had lost Kay—forever!

He felt his inner being sucked into a whirling vortex; the new earth smeared before him in an unrecognizable splotch—and he knew no more.

## VI.

THIS WAS exceeding strange! Consciousness had returned to him, but it was sluggish, dim. Thought was a vague process; he could not coördinate, could not organize those strange, quivering sensations, to which he seemed to have fallen heir, into intellectual being. Far off, so far it seemed to belong to another eternity, another infinity, he had been perfection, godlike, comprehending all things entire. Now he strained toward realization of the present, found his mind

diffuse, scattered, undifferentiated. Already the memory of his former state, even that more limited existence on a by-gone Earth, was fading fast. He tried to grasp the hem of its vanishing garment. It slipped from his fuddled consciousness. Soon even the memory of that memory would be gone.

What had happened to him? Why could he not think? Why were what passed for thoughts somehow vegetative, primitive, engrossed more and more completely with the limited present? *Where was he?*

Slowly, the blinding realization came to him, pierced momentarily the dulling inhibitions of his being. He was moving sluggishly through a warm, enveloping sea. Slowly, very slowly, with a queer, forward-flowing motion. The waters tossed him up and down in regular rhythm; above, a heavily charged sky steamed with beating rain. A huge, dim sun irradiated unendurable glare behind the thick curtain of clouds.

The light irritated Allan. Instinctively, he swelled, wrapped formless pseudopodium around minute globules of water, evacuated tiny bubbles of imprisoned air, and sank slowly and heavily into the darker, more inviting depths.

*He was an amœba—a microscopic blob of protoplasm!*

Even in his simple consciousness the realization rocked his viscous frame, sent him quivering into the uttermost depths of a futile despair. Loring had known, had warned him. They had created a universe, but that universe must evolve along definite paths in accordance with the immutable laws of imperfection.

From barren matter must first come life in its most simple, undifferentiated form. Protoplasm! Amœba! Only after millions of years would life grow upward into complexity—through polyps, sponges, fish, mammals, ape men, man!

Blindly, the protoplasmic ooze that was Allan went its sluggish way. A tinier bit of organism impinged on his tactile surface. Instinctively, he flowed around it, engulfed it. Digestion set in, and he found it good.

But still he tried to hold on desperately to the fast-fading memories of his former complexity. Kay! Again that name blasted him back to a certain dim coherence. She was lost to him, now and forever!

A TIDAL CURRENT caught him in its forward sweep, pushed him helplessly along. In the dim underwater light he perceived ahead of him a colony of vague shapes, fellow blobs of matter, swimming slowly. He caught up with them, feeling the security of his kind.

Dim, familiar vibrations emanated from them, tugged at the sentience that was now himself. What did it mean? He puzzled over the feeling, tried to think it out. It was exceeding difficult. He flowed closer.

A slender, graceful amoeba dissociated itself from the sluggish colony, put forth tactile pseudopodium. They impinged on his formless surface. A great, quivering thrill pulsed through his protoplasmic depths. This was Kay!

He lurched toward her dearness, clung with tenacious embrace to the jellylike

substance that was nevertheless Kay. Electric understanding passed between them. Happiness, sufficiency, pervaded all his being. About them, in a cluster, lay the colony of amoeba—they who had left an incredibly ancient Earth with him, had passed beyond infinity and back again. From them a new world of life would spring, and evolve painfully and adventurously into man. The cycle was complete!

Before the last vestiges of former memories left him, Allan saw as in a vision the dim outlines of the future. He and Kay—together through that long upward climb. Polyps together, slender, darting fish, lordly Neanderthal and his mate, man and woman, devoted, eternally one!

A more-distant vision even was vouchsafed to him. A time when the universe would be close to annihilation; when he and Kay, colonists on the last remaining galaxy, rediscovered the calculus of the totality, and fled again beyond infinity, there to find Peter Loring, timelessly immortal, infinitely perfect.

The mists of present, primeval consciousness closed upon Allan and Kay in irrevocable shroud. They were two amoeba, existent in the moment, knowing nothing of past or future glories. Slowly, they swam through the steamy sea, seeking food and love. Behind them trailed the colony.

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# The DESTRUCTION by M. F. James of AMUL



*The contestants hurled themselves at each other. The entire universe seemed in cataclysmic eruption.*

**A**MIDST the pages of the chronicles of the universe are related countless incidents—mere incidents—that are the histories of the rise and fall of civilizations, of empires, and even of worlds.

The story of the destruction of the

planet Amul is but one of these incidents, unimportant as far as its relation to the universe as a whole is concerned, yet significant if only for the lesson it should—but probably won't—teach the peoples of the myriad worlds scattered throughout our space.

AMUL was one of the two major planets located in a solar system that was uncountable light-years distant. The other important planet was Talul.

The inhabitants of these two worlds, although belonging to the same race of beings, were intense rivals. Each desired to exercise sovereignty over the other.

Such a state of affairs naturally led to continual combat. Indeed, wars had so exhausted the rivals that for several score of their years there had been peace.

Now Talul, having recuperated more rapidly, prepared to again clash arms with her enemy.

The space fleets of Talul struck swiftly.

The mighty citadel of Amul, considered impregnable, fell before a terrific onslaught, and the invaders had won the first encounter.

When the tidings of the disaster at the Amul citadel were communicated to Prince Antl, ruler of Amul, he immediately summoned his advisers.

After consulting with the engineering board, and instructing the chemical department as to its future tasks, the war lords hastened the preparations for a defense of the capital, Alimonaz, from a sudden attack by the space fleet of Talul.

In the meantime, the first battle division of the Talul space navy was on its way to Dolul, the inner moon of Amul. On that satellite, a rocket-ship base had been erected, after the Amulian army stationed there had been forced to surrender.

Nearly a hundred thousand picked fighters of the Talul armed forces had debarked on Dolul and set to work constructing barracks, mounting antirocket cannon, building munition factories, and preparing the fuel stations for the space ships.

The war lords of Amul were well aware of these operations, and they en-

deavored to harass the invaders in every way possible.

Swift rocket patrols swooped down on the base and laid fire and destruction in the enemy's camps. Giant space guns were mounted in such a manner that the trajectory of their shells would end in the midst of the Talul space fleets.

These offensive operations, although carried on with grim determination, failed to distract the attention of the invaders in any great degree.

But they served to mask secret movements of strong infantry forces, and the gathering of many space ships by the war board of Amul. It was evident that she was still determined to carry on the struggle, no matter what the cost might be.

The war lords of Amul decided to take the aggressive, and make a powerful thrust at the Talul base on the inner satellite.

A great space fleet, the largest ever assembled by Amul, formed out in the void. Then, at the command from the flagship, the entire formation thundered through the ether to Dolul.

Fully two hundred huge vessels composed this fleet. On board were every conceivable type of weapon: gases, bombs, guns of colossal dimensions, torpedoes, and rocket-driven shells. Like the now-crumbling citadel, the armada was proudly declared by the overzealous war lords to be invincible.

WHEN the Talul scouting force reported the presence of the Amul space navy to the war commander of the base on Dolul, the latter at once appealed for assistance to the supreme council of his native planet. Then, realizing that the enemy would reach the satellite long before outside aid could come in time to be effective, he gathered his entire rocket complement, including transports, patrol ships, fuel carriers, and freighters, as

well as the few war vessels at disposal.

In all, this improvised fleet numbered about a hundred and fifty units. The Amul armada was far superior, and resistance seemed useless; yet, by the laws of Talul, it was the duty of the commander to oppose the enemy with every resource at hand.

The two fleets met far out in the emptiness of space. The signal for battle array was given, weapons tested. The crews of the opposing forces tensed.

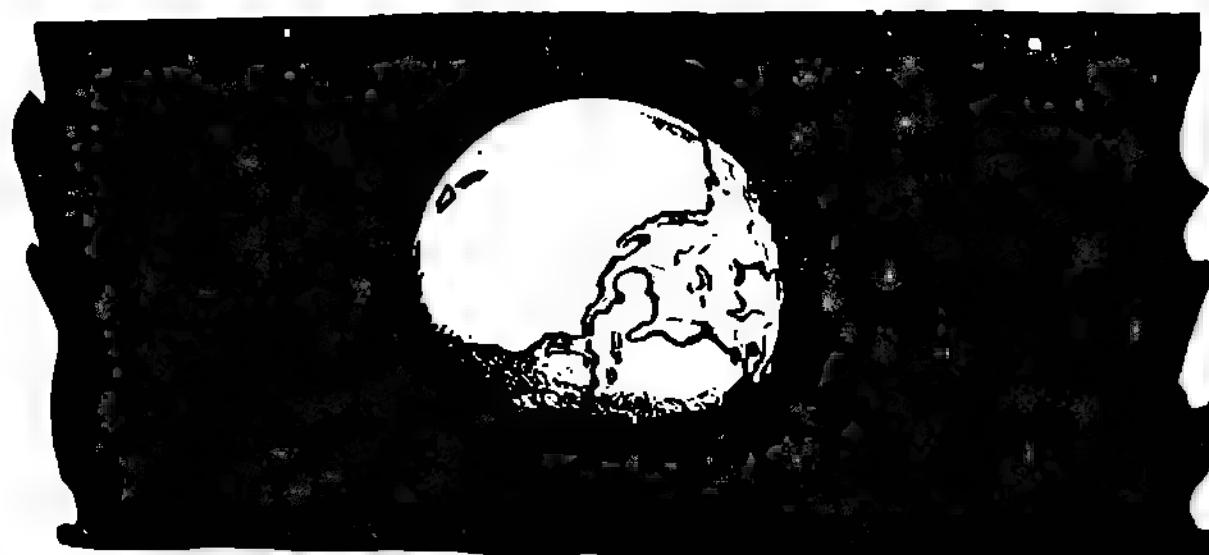
Then the signal to begin action was sounded. The contestants hurled themselves at each other. The vibration of terrific explosions tore the delicate

Talulians had lost over a hundred ships.

It had been a costly engagement to both sides, but more so to Amul. The greater part of her space navy, that she had been relying on to defend herself against the invaders, had been destroyed, and while it was true that her enemy had also lost heavily, it was only too certain that the Talulians could replace that loss—but Amul could not.

Furthermore, the battle, aside from having weakened both forces, had done little else to affect the issue of the war. Amul realized now that upon her next move might depend her independence.

The war lords at once bent to their



audio-detectors of the ships asunder. The entire universe seemed in cataclysmic eruption. Flames plumed to vast heights; clouds of gases appeared briefly, before being dissipated, and the shattered and blackened hulks of once-mighty space cruisers drifted aimlessly and lifelessly about the scene of the conflict, endangering navigation.

For hours the titanic struggle raged. No quarter was sought—none was given. It was battle—furious battle—a conflict to the finish. Thousands of members of the crews perished; thousands more took the vacated places.

Then, as though by mutual consent, the carnage ceased. The fleets separated, the Amul returning to Almonaz, and the Talul to their base on the inner satellite.

But they were far smaller fleets than when they had roared out to battle. The

efforts to discover some means of inflicting a telling blow on their enemy.

TO FORM A BACKGROUND for the climaxing action of war, it will be necessary to include a brief description of the geological composition of the planet Amul.

Amul's surface was almost entirely covered with a dense mass of water, which had made it necessary for the inhabitants of the planet to populate the few islands that jutted above the seas.

Because of the great distance of the little planet from her sun, the surface received hardly a perceptible amount of heat, and only a feeble bit of light, which had caused the days of the planet to have the aspect of continual twilight.

The Amulians, being a warm-blooded race, had thus been forced to find other means of keeping the temperature of their world at a livable degree.

To do this, they had tapped the internal fires, still burning, fed by the flames of atomic disintegration which ceaselessly consumed Amul's metallic core.

Long tunnels had been bored into the very heart of the inferno, and up through these passages the vital heat ascended—the dense rock of the planet being virtually an insulating sheath.

TO CHANGE the subject slightly, now:

It is a common fact of electrical science that water, or steam, passing through air builds up a really surprising static-electrical potential. Machines using this phenomenon have been constructed and are usually termed "hydroelectric engine," a very different device from the hydroelectric generators which take their motive power from the force of swift-moving streams.

THE PLANS put forth by the Amul scientists involved using these facts, especially the static-electrical potential built up by the passage of steam through air, to wreak havoc on the invaders.

In the center of the largest and most important island of Amul was a salt lake, fed by a submarine passage connected with the heavy seas.

In the middle of the lake a sea wall, circular in shape, was erected, and the water pumped from the inclosure thus formed. Now a tunnel was bored deep into the flaming molten interior of the planet. A vast jet of intense heat shrieked up this artificial volcano.

The dikes were then blasted open. The water rolled over the bare area. The seas poured down into the tunnel. Water met fire. Steam was generated.

A tremendous column of vapor soared into the upper reaches of the stratosphere, there forming droplets which fell back to the surface as a fine rain.

The passage of the steam through air had the effect of a gigantic hydroelectric static generator.

The resulting electrical potential was beyond comprehension.

The war lords of Amul contemplated their work. They were satisfied. The trap had been set; now it must be baited. Then it would be ready to receive its victim.

The enemy fleet must be lured into the area of electrical activity; then the elements would do the rest.

AGAIN, a few words of explanation:

Lightning is the result of the sudden discharge of a quantity of static electricity accumulated by clouds.

This electricity is generated by the upward passage of minute particles of water during evaporation. These particles being in friction with the air, during the ascent, are thus charged. Then, uniting with other little particles, they form clouds, which have the combined electrical potential of all the minute charges on the droplets. When the clouds reach the limit of their electrical capacity, a discharge must take place. The result: lightning.

On warm summer days, since evaporation is more pronounced, lightning storms are more frequent. This is apparent.

THE SAME EFFECTS described above were taking place, on a far vaster scale, on the planet Amul. The great clouds of moisture, evaporating as steam, were cooling and collecting about the main island.

They would soon reach the limit of their electrical capacity. Then a discharge would take place, a discharge of catastrophic dimensions. If the Talul fleets should be trapped in the discharge area, their destruction would be certain, and Amul would retain her ancient independence.

Efforts were made to lure the armadas of the invaders into the danger zone. At first the Talulians were, naturally, suspicious. Human nature be-

ing the same throughout the civilized universe, a new method—and a working one—was decided on by the Amulians.

They would play on the curiosity of the invader. The Amulian forces pretended to be determined to keep a tight guard about the danger zone, as though they were hiding some important work which was undergoing completion.

The curiosities of the men from Talul were aroused. They lingered close to the patrols of their foe, attempting to discover the source of activity, unmindful of the foreboding ceiling of dark clouds. The Amulians doubled the guard. Now the Talulians were convinced that they must break through the picket lines and see what was so zealously guarded.

The invaders gathered a powerful force, all their fighting ships. The Amulians retreated, drawing the enemy on.

Both forces entered the electrically charged area. The Amulians, realizing that the discharge would come any moment, now, attempted to flee, leaving the foe to his doom.

BUT alas for the wiles of man. He thinks himself ruler of all things, even the fickle elements.

The Amulians had let the forces of destruction loose. They were helpless to control these forces.

For weeks static electricity was being generated and accumulated by the clouds. It had suddenly reached its capacity, and instruments had failed to warn the Amulians. Now the discharge of the potential electrical charges had to come. It did. Too soon, far too soon, for either opponent.

A vast ball of interlacing lightning bolts encircled the entire planet. The stricken world shook beneath the unleashed fury of the colossal quantities of electricity contained in the clouds. It finally lessened its onslaught, then practically ceased, except for occasional rumblings and flashing streamers of light.

But it had done its work well.

On the entire planet of Amul not a living thing remained—only fused rock and little steaming pools of heavy, green water.

Of either Talulian or Amulian there was no trace, unless it was toppled buildings and shattered space ships.

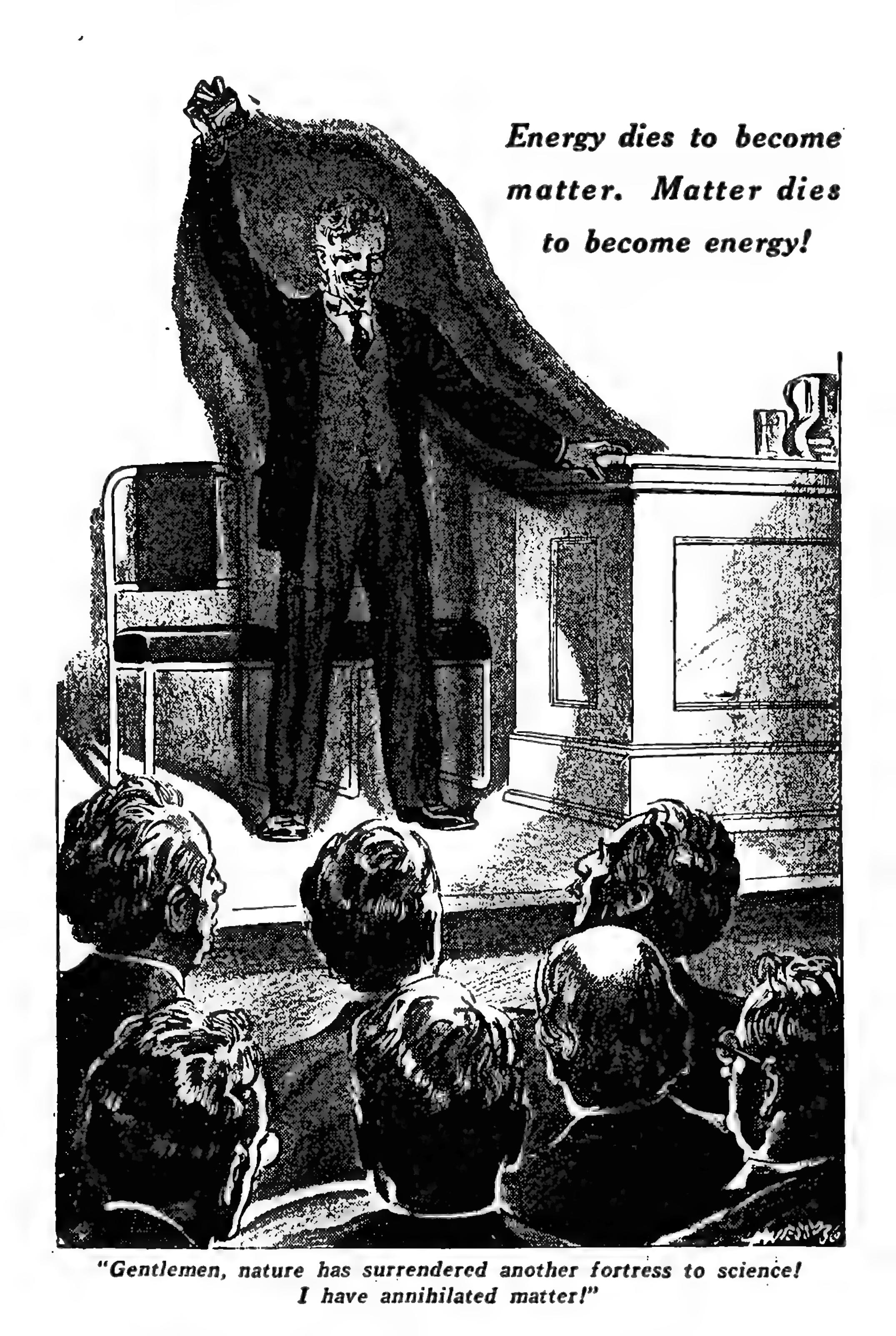
The Amulian had wrought his own doom, as well as that of his enemy.

AND THAT IS WHY, in a far-off universe, there is a solar system where is found a blackened, fused mass of dense rock that once was a populated planet, teeming with creatures, the land of a civilization, and the home of a knowledge of the sciences that was either too great or too small.



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*Energy dies to become  
matter. Matter dies  
to become energy!*

*"Gentlemen, nature has surrendered another fortress to science!  
I have annihilated matter!"*

# LINKED WORLDS

by R. R. Winterbotham

MATTER, my friends, is as illusive as infinity. Without matter the universe—if a universe could exist without matter—would be without complexity and correspondingly uninteresting. With matter, the universe becomes a will-o'-the-wisp, always before us, but ever beyond comprehension; daring, challenging and beckoning to our curiosity; baffling, befuddling to our minds; terrorizing and frightening to our primitive natures, and overwhelming to our imaginations.

"What matter can be, man has guessed. But none are nearer right than Shakespeare—not a scientist, but a bard, who dismissed the subject with: 'The world's a stage.' Our present-day scientist can say no more. Matter is the scenery and props for the pageant of the universe. Truth is always escaping us. Like infinity, the truth of matter is as far away after a thousand years of science as it was when our journey began. I am afraid, fellow scientists, we will never know what matter is!"

A wave of applause swept the auditorium as Dr. Hubert Leighton finished reading his paper, "Illusive Conceptions of the Material Universe." It had been received as a well-prepared philosophical discourse on the progress of science from 1564—the date of Galileo's birth—to the millennial celebration in his honor at Philadelphia in 2564. For forty minutes it had held members of the American Society of Scientists spell-bound.

Although Leighton had said only that matter and its nature were unknown, possibly unknowable, hundreds of great minds gathered for the millennial celebration had been intensely interested in

the way he said it. Only a scientist can appreciate the value of a negative result.

The chairman, Dr. Gadby, rapped his gavel to restore order.

"Any questions for Dr. Leighton?" he asked.

In the front row, a small man with an impish, mischievous face, vaulted to his feet. Leighton had noticed him as he delivered the lecture. The small man had listened intently, his lips moving, seemingly mumbling.

"Mr.—ah—the man in front—" said Dr. Gadby. "I do not recall your name."

"Erraman is the name. Terrence Erraman. Your records will show that I am a member of the society in good standing, that I always pay my dues, and that I usually pay more attention to my work than to gadding about to conventions."

"What is it you wish to ask, Mr. Erraman?" broke in Leighton, anxious to smooth over the evident irritation of the man.

"Dr. Erraman, if you please!" corrected the little man. "I came here principally to hear your talk, Dr. Leighton. I have been sadly disappointed. Gentlemen of the society, Dr. Leighton has the mind of a worm. And you seem to agree with him. Therefore, your conceptions are those of worms. Poor, dumb—"

"Come, come, Dr. Erraman. This is no place to indulge in personalities. If you have nothing to add in the way of enlightening discussion to Dr. Leighton's paper, please sit down. You may dis-

agree, if you wish, but Dr. Leighton has expressed a popular viewpoint, and he is an authority——”

“An authority! Bah! I am an authority, too. Dr. Leighton denies. I affirm. Dr. Leighton says that man can never know what matter is; I say man can. Gentlemen, nature has surrendered another fortress to science! I have annihilated matter! I have destroyed matter utterly!”

The little man swelled his chest and paused. A wave of low exclamations swept the room. With a spring, Erraman hopped to the speakers' platform.

“The universe is man's!” he announced with finality. “Interplanetary travel, transmutation of elements, mechanics, genetics and thousands of other secrets and problems have been solved since Galileo's day, one thousand years ago. The secrets of the atom—of matter—were besieged; but they would not surrender. You, gentlemen, lost hope. You agreed with Dr. Leighton, who said, in effect: 'This stronghold is not worth conquering. Let us say that it is not a stronghold, but something that cannot be. And let us hear no more about it.' But, as you were kidding yourselves, I reached a partial solution. Before the sun rises to-morrow, gentlemen, I will know the answer!”

Erraman stopped talking again. From his coat pocket he pulled a small instrument about the size of a candid camera. He held it above his head. A red beam flashed from the side of the instrument and floated downward, covering Erraman with a cloud of crimson.

Erraman opened his elfin mouth and laughed. To a man, those who sat in the auditorium rose to their feet. Erraman was fading away. He was disappearing like a cloud of vapor. In a few seconds he was gone. Only the camera and the red cloud remained. Then the instrument disappeared and the red light blinked out.

IT WAS a startling exhibition, and the newspapers made much of the episode. What had happened, no one knew. But Erraman had gone, like the flame on a candle. He had done something and left science without a solution.

Puzzled and perplexed scientists pondered over the problem. Erraman had disappeared. He had destroyed himself perhaps, but his method was worthy of scientific investigation.

Leighton, among others, doubted that Erraman knew more about matter than any one else. But Erraman certainly had annihilated matter without the slightest appearance of explosive force. The little gadget, which looked like the kind camera newspapermen use to snap forbidden faces, made use of a principle certainly unknown to Leighton.

“The least he could have done would have been to leave behind the blue prints for his invention,” censured Leighton.

But when Erraman's laboratory, in a Western State, was located there were no formulæ and no papers to elucidate his invention.

Science had nothing to do but soothe its jangled nerves and again lay siege to the fortress of nature called *matter*.

Dr. Leighton was one of the first to accept the challenge. Not to be beaten by an unknown, he began a vast series of experiments.

Starting with hydrogen, No. 1 in the chemical scale, Leighton began to examine each element. It was possible that he might extort the secret piece by piece from the ninety-odd building blocks which enter into the formation of matter itself. Molecules were measured by X rays. Orbita of electrons were computed. Internal structures of atomic systems were given careful scrutiny. All of these things had been done before, but not by one man. Leighton sought a clue that had eluded others.

He reached erbium, No. 68 in the

scale. He subjected it to the routine experiments. One of these was to create artificial radioactivity in a small bit of the substance by subjecting it to a neutron bombardment.

About halfway through this part of the test, Leighton's instruments disclosed an unusual amount of activity in the vacuum tube in which the erbium was being treated.

Leighton viewed the erbium through a peephole. One look convinced him that it was no longer erbium. Subsequent tests proved conclusively that it was radium. The erbium had been transmuted into a quantity of radium worth several hundred thousand dollars. It was inexplicable.

Retracing his experiment, Leighton found he had made no mistake. Everything had been done in the orthodox manner; yet he had done something that upset the entire field of chemistry.

There is nothing new in making one element from another. That had been done as long ago as the Twentieth Century. Electrons may be knocked away from an atom, and nucleuses may be added or subtracted by bombardment, creating a new substance. But the method of doing this is highly technical and laborious, and it must be done under special conditions.

The induction of artificial radioactivity might have caused erbium to become another element in time, but the new element would have been one lower in the atomic scale than itself, surely not radium, which has a greater atomic weight.

Science does not rely on the result of one experiment to answer its questions. So Leighton tried it again. Once more he subjected erbium to the bombardment. He varied as little as possible from his original procedure and he expected the same results.

Again the erbium changed. But it became less radioactive than it should have been. Leighton discovered that he had transformed the element, not into

radium, higher up the scale, but into masurium, which is below erbium in the scale.

Had this happened the first time, Leighton would have ascribed the result to the speeding up of radioactive disintegration of the erbium. But the first result still baffled him.

Once more he tried the experiment. Once more he obtained different results. This time, however, he saw nothing as he peeped into the tube. The erbium had vanished into thin air—or rather into a thick vacuum, for the experiment was performed in as near a vacuum as is humanly possible to attain in a laboratory.

Upon examination of the tube, however, Leighton found it was full of nitrogen, the gas which forms a large part of the air breathed by man.

Leighton was as shaken as if he had seen a ghost. No theory, no scientific formula, nothing he knew or ever heard of could explain his results. He might have reconciled the change of erbium into another element or even two elements. But *three!* Only hallucination could explain such a result.

Leighton took his own temperature. He was a bit feverish, perhaps, but not much above normal. His pulse rate was high and his respiration was abnormal. Failing to attribute these symptoms to the excitement following his discoveries, he decided that his supper had not agreed with him and that he had been seeing things. He went to a sleepless bed.

THE FOLLOWING DAY he found the radium, masurium and nitrogen still in the laboratory. He called Dr. Gadby to witness a repetition of the experiments.

Shakily, and fearing that the erbium might change unexpectedly into a bowl of goldfish or a magician's jack rabbit, Leighton inserted it into the vacuum chamber. Some time later, Leighton and

Gadby were examining a lump of radium.

"At any rate," said Dr. Gadby, who had heard of the first results, "the experiment is repeating itself."

Leighton shook his head sadly. He tried it again. Masurium was produced. Then, as Leighton changed erbium to nitrogen, Dr. Gadby sank into a chair. A short time later, Dr. Gadby was taken raving to a hospital.

It was several days before Dr. Gadby was able to sit up and take nourishment. Even then, the scientist displayed symptoms of amentia, morosis, hypochondriasis, melancholia, hysteria and other vertiginous ills.

For hours, Dr. Gadby would rattle off chemical equations. At first he would dive into a sea of organic symbols, swim the length of a chain molecule, and stagger ashore with a simple carbohydrate in his mouth. Then the patient opened up on the inorganic field. He danced in and out of industrial equations for the manufacture of acids, bases and salts. Then he staged an act all of his own. He juggled the ninety-two elements from transmutation to transmutation. He mixed iron and aluminium to create sulphur and hydrogen.

Dr. Gadby was in one of these moods when Leighton came to see him.

"Six Er plus two Ra equals two Ma, two plus two N," piped Dr. Gadby in the way of a greeting.

Tears welled into Dr. Leighton's eyes as he saw the condition of his friend. "There's no such formula, my friend —" began Leighton. Then he choked an exclamation. His jaw sagged, and he snapped his fingers. "By Jove, I believe you hit it!"

Pulling an envelope from his pocket, Leighton jotted down the chemical symbols for erbium, radium, masurium and nitrogen: Er, Ra, Ma, N.

"*Erraman!*" He shouted. "He's trying to communicate with us!"

The keeper came, and after some dif-

ficulty, Leighton was allowed to leave the hospital.

Scuttling home to his laboratory, Leighton tried to establish communication. He repeated the experiment with erbium. He tried other elements. But there was no reply. Erbium remained erbium with artificially induced radioactivity. There was no other change in the other elements. The attempt at contact had failed.

DISGRUNTLED, the scientist returned home that night. He switched on the radio. The music of a symphony orchestra soothed his jumpy nerves. There were several possibilities. First, and most likely, was that Erraman was still alive in some mysterious netherland where matter was not matter and that the transmutation of erbium was an attempt at communication.

The second possibility was that Dr. Leighton had stumbled upon something that had no relation to Erraman at all. The similarity of the chemical symbols and the letters in the missing scientist's name might be purely coincidental.

Another possibility was that Erraman had notified Leighton he was on the right track by leaving a warp in the wave structure of matter which would serve as a guidepost to the experimenting scientist.

The reverie was broken by a squawk of the radio. As Leighton leaned forward to adjust the wave control, the music faded and a high-pitched buzz arose. Then a vehement voice broke into the program,

"Don't cut the switch, Leighton. This is Erraman."

Leighton was badly shocked. His nerves had suffered much in the past few days.

"Where are you?" asked Leighton, after he recovered his composure.

"If you want my position in relation to material things, I'm afraid I can't oblige you. I'm just as near to you as I

am to the farthest nebula. I exist outside of matter. To you I exist *nowhere*. But if you wish to know where I am in relation to energy, I can tell you. I am just a short-wave-length negative of the second electrical flow on the positive side of the chemical reaction going on in your liver."

"Humph! Your voice is coming in over the radio loud-speaker."

"That is as it should be. The radio is equipped to speak. If my voice came from the floor lamp, you might have reason to doubt your sanity."

"I do as it is. How can you hear me?"

"I don't *hear* you, strictly speaking. I am able to translate the electrochemical reactions in the speech centers of your brain. It took practice, but now I'm quite a proficient mind reader."

"I give up. If I'm crazy, I'll make the most of it. Perhaps—I hope so anyhow—you were right when you spoke at the millennial meeting. You promised to solve the secrets of matter. What are these answers?"

A low-voiced chuckle came from the radio. "You've swallowed your pride; I'll swallow mine, Leighton. You were right. Men can never know matter so long as he is matter himself. I am matter no longer. I am energy."

"For years man has suspected that matter was a form of energy. But man knew no more of energy than he did of matter. Energy, to man, was a certain something that makes the wheels go round; it made the sun shine, caused chemicals to react, stoves to grow hot and telephones to talk. Energy acted on matter."

"As I studied the problem, I wondered if the process could be reversed. I asked if matter could act on energy. Atomic power was the answer. With it I could discover how to make matter act on energy; I could run the machines of the world with a handful of pebbles."

"My experiments led to the construc-

tion of the energy magnet, the small box that looked like a camera, which I used at the society meeting. It was the nearest approach to material action on energy. It could draw energy into it, just as an ordinary magnet draws iron. The machine was carefully insulated; inclosed in vacuum to ward off heat, protected against electrical induction, and carefully shielded from light.

"Perhaps you noticed the cameralike lens. The machine works differently from a camera, however, since the lens must be closed to cause the magnet to operate. As long as the lens is open, the magnet absorbs enough energy from the outside world to neutralize its action. When the lens is open it will absorb energy within a six-foot radius. Then it begins acting on matter. After that it absorbs itself——"

"Something like the snake that got its tail in its mouth and ate itself, I suppose," scoffed Leighton.

"Your analogy is wrong. It is more like a spontaneous chemical reaction. But, to continue, I modified my instrument so that it would absorb both matter and energy at the same time. In this case, a living creature could be absorbed from the material world and placed into an energetical world without harm. A man might be transferred into living, conscious energy!"

"So you performed the experiment on yourself!"

"Don't get me wrong. I didn't plan to be one of science's martyrs. I was quite sure I would not be harmed, even if I found it hard to get back to the material world again. I considered the possibility of becoming immortal, both literally and figuratively, by the process, since there is no destruction of pure energy. Besides, the more I thought about an energetical world, the more curious I became to see it. Now I have seen it, and I am quite satisfied with it. Even if it were possible to return to the material world, I would not do so."

"The energetical world is not far different from the material, so far as comforts are concerned. There are hills of heat, oceans of electricity and creatures of light. The life here has an intelligence on a par with human intelligence, if the creatures are a little bizarre in appearance."

"In what form of energy do you exist?"

"I seem to be changing continually. Most forms of life here appear as light creatures, although some are in colors not visible to your eyes. When I first made the transfer from the material world, I existed purely as heat. Gradually, I changed to chemical energy, in which form I managed to communicate to you by spelling out my name in chemical symbols. Then I progressed to my present stage, that of electricity. I seem to be growing."

"Where will you stop?"

"I do not know. But I have learned that energy is not immortal, as I once thought. Energy does die. The process of slowing down, guessed at by Eddington in the Twentieth Century, is more than apparent in my world. Energy grows old, decays and dies. But I must leave you, Leighton. It is a strain to crowd my electrical flow through the loud-speaker of your radio. I am weakening. To-morrow, I plan to meet some of the light creatures, after which I will talk with you again. Good-by—"

DR. LEIGHTON did not sleep a wink that night, nor the next day. For hours he sat as one hypnotized, studying what he had learned. Energy and matter—different, yet the same. A world of matter drew on energy to supply its needs. In a world of energy, did the living creatures draw upon matter? Erraman had not said that, yet he implied it. There were three kinds of matter, just as there were various forms of energy. Matter appeared in the gaseous liquid and solid states. Perhaps

creatures of energy warmed themselves with gas, saw by the light of liquids and used solids for power. One form of matter could be changed into any other, just as one form of energy might be converted into others.

The two worlds, material and energetical, seemed inseparable, yet unlinked. Could matter create energy? Could energy create matter? These questions must be solved, Leighton decided. If he could learn a single factor in the equation he could solve them. The knowable factor, he believed, was Erraman.

For hours he sat, waiting for the radio to blur again, and to hear the voice of the missing scientist pipe news from another world.

The sun climbed from the east and slid down in the west. Leighton filled and refilled his pipe as he sat thinking and listening. Then, as night deepened, the radio spluttered. It slowly began to fade.

Leighton leaned forward. His face was flushed with excitement. His pipe slid to the floor as his lips quivered. The radio faded and the hissing arose.

"Leigh-ton!" came a whisper.

"Erraman! Erraman! Are you there?"

"I'm—here! Energy—men—got—me!"

"What's the matter?"

"I'm dying—Leighton." The voice grew weaker. The radio seemed to lack power. Only a feeble flow was going into the speaker.

"Erraman! You can't go! We must find the link between energy and matter! Tell me, does energy create matter? Does matter create energy?"

"It — will — be — found—out—some day!" sighed the radio. "I'll—leave—a—message. Good-by."

The voice trailed off. For a moment the radio was dead. Then the strains of a jazz orchestra blared from the speaker. The bridge of the worlds had been washed out.

HOWARD LEIGHTON, an astronomer of the year 2764, looked through his small three-hundred-inch reflecting telescope at a super nova which had recently blazed from the bowl of the Big Dipper. Howard was a descendant of Dr. Hubert Leighton, the well-known exponent of the material-energy theory in the year 2564. Beside Howard stood his father, John Leighton.

John was the last of the Leightons to bow his head over that seemingly insolvable problem—the creation of matter and energy. His son, Howard, had thrown off the yoke of the Leightons and taken up astronomy.

Howard had decided that the crazy diary left behind by Hubert Leighton in the Twenty-sixth Century was the work of a crank. All the Leightons down to Howard had been cranks. Howard had decided to be an astronomer.

The nova, a good two thousand light-years from the solar system, was behaving queerly. Both Leightons remarked on it. As Howard watched he saw it flash a letter—the letter C.

Another letter flashed—O. Then it spelled N-G-R-A. Howard sucked in his breath. T-U-L-A-T-I-O-N-S.

"Congratulations!" read the astronomer. "The nova is spelling in English!"

It spelled more words:

L-E-I-G-H-T-O-N.

"My name!" whispered Howard.

"And mine. Also that of the Twenty-sixth-Century Leighton," added the father.

E-R-R-A-M-A-N.

*Erraman!* The name that appeared in Hubert Leighton's diary.

"Congratulations, Leighton. Erraman," translated John Leighton. "That's the answer. Hubert Leighton was not mad. Erraman said he would leave a message, and he did, although it took two thousand years for the news to reach earth. Do you remember the words of Erraman, as quoted in Hubert's diary? 'I'm just as near to you as I am to the farthest nebula.' "

Howard did not turn his head from the telescope as his father finished speaking.

"Yes, father," he said. "This is the answer. Erraman's message. Energy becomes matter through burning stars. But how does matter become energy, I wonder?"

There was no reply.

The young man turned from his telescope. He gave an agonizing cry. John Leighton had fallen on the floor. John Leighton was dead.

In the bowl of the Big Dipper, the nova flashed a reply: "Energy dies to become matter. Matter dies to become energy."

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by  
JACK  
WILLIAMSON

# The BLUE



**S**WIFT AND SILENT, the compact, streamlined egg shape of the aërodyne flung westward, high in the moonless dark. Ivec Andrel, alone at the controls, shivered to a little chill

of ruthless apprehension. In the whisper of the wind he heard the rushing wings of doom. In the coolness of the night his excited imagination felt all the deadly rigor of the age of cold ahead.

# SPOT

*Part I of a  
great scientific  
two-part novel*



*A shrill, whining hum, a flicker of electricity, and a blinding needle stabbed toward his face.*

His gray eyes fixed and solemn, he peered northward. Remote and motionless, the eternal stars burned in the blue of midnight—and newly written among them was the doom of man. Across the

constellations, from Perseus to Lyra, coiled a monstrous cloud. It had the shape of an octopus, and its writhing tentacles were icy blue with a bitterness of cold beyond imagination.

Tense with a living dread, he saw again his father's face as it had been that afternoon in the bright oval of the telephone—pallid and graven with care, stern with an undying purpose. He heard again the solemn, urgent words: "My son, the time has come. The sign is in the sky. My part will be done tonight, and yours cannot be delayed. I shall expect you by dawn."

Brief and guarded as the message was, it conveyed a dreadful meaning. There in the great lyceum of sciences, upon the green, sea-pressed Bermudas, Ivec had made hasty farewells to instructors and friends.

Now, sitting rigid in the aërodyne, he opened the motor coils to full drain upon the planetary power field. The whisper of the wind against the hull became a rushing hiss. His hard, white-skinned body leaned forward, as if to press the flier ahead. Cold sweat pearled his face. Dilated with indwelling dread, his gray eyes clung to the shapeless thing of chill blue in the north, the formless cloud of doom.

Yet a little joyous eagerness crept up beside his dread. For he might once again see Thadre Jildo. A glance, a word, a touch—a crumb of life snatched from the maw of death.

It was six years, now, since he had left her at the mountain laboratory, to take up his arduous course at the lyceum; yet the loveliness of her still burned clear in his mind. A tall girl, fair-skinned and graceful. Her copper-glinting head tilted proudly. Her blue eyes large, expressive, often imperious.

Their last meeting had ended, as usual, with a quarrel. Ivec held his breath with the memory of her, so beautiful in anger.

Deliberately, to touch her pride, on

that last day, he had boasted: "I'll be back one of these days, Thadre, to be director of the laboratory."

Her fair skin flushed, at that. Her bronze head lifted; her blue eyes flared at him. For the rivalry between the families of Andrel and Jildo was almost a feud.

The Jildo Power Laboratory, established generations since to solve the myriad problems of supplying power freely to all the people of the Earth, had become a vastly important institution, its directorate an honor much coveted.

"You!" the girl exclaimed, scornfully. "You, director? When you are just a mass of muscle—and an Andrel!"

IVEC ANDREL bit his lip, repressing his own flare of anger. In an age of physical perfection, when health was universal and the average height well above six feet, he, nevertheless, possessed exceptional stature and strength. It always infuriated him to be ridiculed for his athletic prowess, with the cutting inference of mental inferiority. The girl knew his sensitive spot, from many another quarrel.

"My father is now director," he told her flatly. "So was his father and his grandfather, Delshar Andrel—"

"But before him, the director was Athon Jildo, who founded the laboratory and invented the planetary power field. ~~Delshar~~ Andrel was a mechanic in his shop—"

"Who revised the theory of the power field," Ivec put in, "and redesigned the generators to keep half the power from leaking away through the ionosphere, into space."

"Athon's brother, Korac Jildo," the girl said, "was the first man to reach Mars."

"Good!" jeered Ivec. "But he didn't come back."

"Anyhow," she gasped, "my uncle,

Barthu Jildo, is the greatest scientist in the world—"

"Did my father tell you that?"

"Well," she conceded, "next to your father. But Barthu should be the next director. He's more than a bag of muscle—"

Ivec Andrel flushed in his own turn, and bit savagely at his lip. In many visits to the laboratory, he had come to know Barthu Jildo. A tall and powerful man, almost as fair of skin as his niece, although his hair and massive brows were black. His bearing was insolently proud. He had long been assistant director, chafing at his subordination to Ivec's father, Jendro Andrel.

"Yes, he's more than a bag of muscle," Ivec retorted, stung beyond restraint. "He's a maniac. His brilliance makes him dangerous. He should be summoned to the psychophysical clinic, for examination and treatment, or elimination—"

"I understand you, Ivec Andrel," the girl said to him, enraged. "I see the miserable cunning in your primitive brain. You know you can never win the directorate fairly, above my uncle. So you plot to have him summoned—put out of your way—"

"Thadre!" he protested, stricken. "Surely you don't believe—"

She was turning away from him, her square chin high. Her lovely face, drained of color, was cold and hard as marble. He caught her quivering arm, stopped her. She swung on him deliberately, eyes dark and stormy.

"Animal!" Her voice was low, savage. "If you can understand nothing but muscle—"

Her open hand struck his face, with a grim and unexpected violence. Ivec released her, stared after her, open-mouthed. His fingers touched the blood oozing from his cheek, and he broke into a short, ironic laugh.

Now, aloft in the aérodyne, hurtling beneath the menace of the nebula, Ivec

smiled at the memory of that quarrel. For he and Thadre had quarreled many times since they were old enough to understand the rivalry between their families. Each had striven fiercely to excel the other in their studies of science. And friendship had always endured beyond hurt feelings.

IT WAS on that same day, before he left the laboratory, that his father had told him of the nebula. Outlining the studies he was to take at the great lyceum on the Bermudas, his father said: "We Andrels have a task that must be done, Ivec—for the very life of man. Delshar Andrel began it. For three generations we have worked at it. I cannot finish it alone. But you must, my son—or it will never be finished."

Eagerly, Ivec demanded: "What is it, father?"

His father rubbed his lean chin doubtfully.

"It is rather a terrible thing to tell a young man," he said slowly. "But you must know, so you can be working to fit yourself for it. Promise me to say nothing to your friends about it, for it is a secret outside the council of science."

Vastly pleased and excited, Ivec promised. His father took him to the wide, flat roof of the laboratory on the mountain, where the great electronic telescope bulked black against the sky. Ivec already knew the controls of this instrument, whose photo-electric screens were far more sensitive than the human eye.

"This telescope," said the old scientist, "was built by Delshar Andrel to investigate the calcium clouds scattered through space. His first discovery was a dusty nebula—a colossal cloud of nonluminous particles.

"Calculating the mass, dimensions, and motion of the nebula, he found that our Sun and its family of planets must pass through it."

Ivec asked anxiously: "There will be a collision?"

"No," his father said. "The dusty particles are very fine, very thinly scattered. Our Sun and planets will pass completely through the nebula, in about one hundred years, without being measurably slowed down."

"Then what harm—"

"While the particles are as far apart as the air molecules in a good vacuum, ninety-three million miles of them will make an effective filter. Most of the Sun's radiation will be absorbed before it reaches the Earth. That hundred years will be the most terrible ice age the planet has ever known. Even the air, before the end, will freeze and fall like snow."

The youth shuddered, wide-eyed.

"But won't the weather control still warm the cities?"

"That takes power." His father smiled somberly. "Most of our power comes from the tides and the solar-electric plants. When the sea freezes, there will be no tides. When the Sun is hidden, the solar plants will stop."

"We could dig burrows," Ivec suggested, "and go deep down until the cold is over. Volcanic heat—"

His father shook his head.

"A few might survive a hundred years," he said. "But the ice and snow would change Earth's albedo, make it reflect most of the Sun's radiation. It might never be temperate again. Low forms of life might persist. But mankind would perish in the end, miserably."

The young man looked up hopefully.

"But there is a way? You have found a way?"

His father nodded soberly. "With power enough—power independent of the Sun," he said, "we could extend the weather-control system over all the planet. We could keep it warm, in spite of the nebula. We could light the cities and the farms, run the factories—keep life itself alive."

IVEC was staring at the black, multiple barrel of the instrument.

"I was thinking," he said slowly, "of an equation Thadre and I learned:  $E = Mc^2$ . That is the energy equivalent of matter, when  $c$  is the velocity of light, in centimeters per second. The result is about nine hundred quintillion ergs per gram.

"The material energy in the loose boulders on this mountain would light and heat the planet through all the century of cold—if we could set it free! But I beg your pardon, father. I know that can't be done."

His tall father had eagerly caught his arm.

"But it can be done," the lean scientist said. "The transformation of matter to energy is constantly going on in the Sun. The Sun's loss of weight by radiation is four million tons per second. It is taking place in all the stars. In some—the supernova—it happens very suddenly.

"Even in certain laboratory experiments, the energy of the atom—the limited portion called the binding energy—has been set free. But we were forced to abandon such direct attempts long ago, because of the very danger of success—success that would burn up Earth and all the planets and the Sun itself in the brief flame of a supernova.

"Some catalyst is what we must have—an agent to control the process. All our research has failed to discover it. Yet mathematics assures us that it must exist—that, in fact, it must be a rather simple modulation of field tensions."

The tall scientist paused to touch the telescope.

"Calculations tell us the process must exist," he said. "This instrument proves that it does."

Eagerly, Ivec Andrel demanded, "How?"

"My father," the old man said, "searched all the known planets with this telescope, for any useful clue. From

Mercury to Pluto, he found no high intelligence surviving, nor anything hopeful.

"But, in the year I was born, he discovered a new planet that he named Persephone. It is a tiny world, only two thousand miles in diameter, smaller than the Moon. Four times more remote than Pluto, it keeps a mean distance of sixteen billion miles from the Sun, so far that the solar radiation takes a whole day to reach it.

"That small globe is immeasurably the most ancient of the planets. Its volcanic energy and its store of radioactive elements must have been long since exhausted. At its tremendous distance the Sun is no more than a very bright star, unable to warm it appreciably. It should be frozen, utterly dead, but a few degrees above the absolute zero.

"Most of its surface proved to be a dark, frigid waste of time-shattered mountains, airless and barren. But my father discovered a small, shining area—perhaps a hundred miles long—which he named the Blue Spot.

"An amazing discovery. The Blue Spot radiates far more energy than the entire planet receives from the Sun. Upon a world so ancient, all chemical, radioactive and kinetic sources of energy must have been exhausted ages since. But one conclusion was possible: the energy of the Blue Spot comes from the controlled conversion of matter!"

"Analyzing the emanations of the Blue Spot with the electronic spectroscope, my father found proof of that theory. The blue is monochromatic—its spectrum shows a single bright line. But, far beyond the ultra-violet, he found a few quanta so powerful that, as he demonstrated mathematically, they can originate only in the liberation of material energy.

"Life and intelligence, my father believed," the old man concluded, "exist upon Persephone. It has discovered the

catalytic agent that we must have, to save the Earth from cold——”

Ivec Andrel was eager, on his feet.

“Then,” he cried excitedly, “somebody must go to Persephone, to learn that process.”

Oddly, his father looked away for a moment, and back at him with eyes curiously glistening. He seemed to gulp, and nodded silently.

“But how?” the young man put the question. “When the penetrating radiations and high-energy particles of space destroy the bodies of men in their rocket—and when the best rocket we could build had power to take Korac Jildo only so far as Mars, where he died of his burns? How?”

“I am working on a way, Ivec,” his father said solemnly. “A strange way. By the time you have finished your course at the lyceum, I may have it ready. And you must be ready to go and——”

“I?” He was amazed, vastly excited. “I shall go out to Persephone——”

“If I can prepare the way before the nebula stops my work.”

Trembling, Ivec again demanded, “How? It must be something more wonderful than a rocket?”

“I’ll show you,” his father said, “when you come back. It will mean effort, pain, great sacrifice. You must fit yourself for it. Follow the program I have outlined. Try to develop mental readiness, courage, endurance, strength. For the life of the world may depend on you.”

“I will.” His voice broke. “Father, I will.”

But now, in the aërodyne slipping through the dark, Ivec shivered again. What effort of his could avail against the dark might of the nebula?

## II.

DAWN was in the sky as Ivec Andrel dropped the aërodyne toward the

isolated laboratory upon its lonely mountaintop. The monstrous blue spiral of the nebula was drowned in rosy light. Like the flames of a burning world, a crimson sunrise flared up behind a ragged wall of mountains he had passed. The Sun itself, red as a drop of blood, drenched the world in sinister light.

The light was red, he knew, because the fringes of the nebula already filtered out the shorter wave lengths, which carried the greater energy. Already the dread change had begun. He shivered to the coolness of the dawn.

The laboratory stood as he remembered it, a long, windowless metal building, low and rectangular, carrying the squat bulk of the electron telescope on its flat roof.

But half a mile down the grassy ridge of the summit, he saw a structure new to him. Twin towers lifted high the silver globes of colossal resonance cells, to tap the power field. Transformers, condensers, and tuning units bulked large beneath them, within screening metal barriers. Between them, connected with snakelike power cables, a small, square building rested upon tall insulating pillars.

Still shuddering to the chill of the morning, Ivec grounded the aërodyne upon a gravel plot beside the laboratory, and ran eagerly inside the long building. The ancient corridors, familiar with their chemical smell distilled from centuries of experiment, were deserted, silent.

His father’s office, with the proud legend on the door, “Jendro Andrel, Director,” was dark, locked. He found the door marked, “Thadre Jildo, Technician.” It, too, was locked. But a light caught his eye, shining yellow and pale through the translucent panel printed, “Barthu Jildo, Assistant Director.”

Ivec tapped, entered. Barthu Jildo looked up, with hostile eyes, from a desk untidy with scientific models, instru-

ments, and papers. His massive body, unhealthily pale, stiffened aggressively. His heavy, black brows drew into a frown of disfavor.

Harshly guttural, his voice rasped out: "Young Andrel! If you want your father, he's down at the new photon laboratory." His thick lips sneered. "So you've returned to become the new director?"

Ivec bit his tongue upon an impulsive retort. Struggling to conceal his dislike, he said carefully: "No. I have been studying at Bermuda for a job my father has ready for me. I have come back to undertake it."

"Then it hasn't occurred to you that success will be rewarded. If you go alone to Persephone, and bring back the knowledge that will save the world from cold—you don't know that any possible honor will be yours for the asking."

Ivec clenched his hands.

"When the world is in danger, I won't quarrel about empty honors," he said hotly. "If my father thought another man could do this task better than I, he would send that man. But I have spent years in training—"

"You Andrels have always plotted to keep all opportunity and honor in your own family. Now your devoted father is planning to give you a power that no man has ever had, the opportunity for such an adventure as no man has ever dreamed of.

"He has refused to give it to me, when I am assistant director and it is rightly mine." Savagely, his fist crashed to the desk. "I'll show him that Barthu Jildo cannot be scorned and ignored. I'll prove—"

His jaw set grimly. Ivec Andrel had retired through the door. He turned his back on the bitterly storming man, went out of the building and along the ridge to the photon laboratory.

THE THROBBING HUM of tremendous energies told him that the high

argent globes must be draining a vast river of power from the planetary field. His father appeared at the door of the odd little room on its stiltlike insulators, pointed at a warning of dangerous voltages.

Ivec waited ten minutes before that throb of power ceased, and his father came down to meet him. Now in his eighty-seventh year, Jendro Andrel was yet almost as tall and straight as his son. A long weariness shadowed his ascetic face; but his features were yet firm, his clear eyes bright with a calm and invincible purpose.

His strong arms embraced Ivec, eagerly.

"I'm glad to see you, my son. I have had good reports of your work. You are ready?"

"I hope so, father." Troubled, Ivec glanced at the red sunrise. "Last night I saw the nebula in the sky. Now the Sun is red and cold. Is there time?"

"Not too much," his father said. "What you saw was an outlying spiral—a warning. Its absorption has dimmed and reddened the Sun. But we shall pass through it in a few weeks. It is yet four months before we shall reach the parent cloud.

"You have four months to go out to Persephone, discover the catalyst that controls the liberation of material energy in the Blue Spot, and return to Earth with the information. If you are late, you will be lost—and the world with you—because you can't return through the nebula."

"Four months!" whispered Ivec, alarmed. "When it took Korac Jildo's rocket two months to reach Mars, at a million miles a day. And Persephone is two hundred times as far! But it isn't a rocket, of course." He caught his father's arm. "Tell me, how am I to go?"

The old man's eyes seemed suddenly stricken. He seemed suddenly lonely and helpless upon this bleak mountain

ridge, fearful, crushed with a sense of tragic loss.

"You are tall, Ivec," he whispered softly. "You are fine and strong and handsome. You must love your body?"

"Why—I have tried to make it strong." Ivec was puzzled, awed. "You told me I would need strength and endurance. I guess I'm proud of it, too—even if Thadre did laugh at my strength. But why?"

His father's eyes were full of gravity.

"Are you brave enough, my son, to surrender—your body?"

Ivec stepped back a little, with lifted hands. He swallowed, said in a low tone, "I'll not shirk my task. Tell me what it is."

"I'm glad." His father caught his arm affectionately. "Come."

IVEC followed him up into the little square room. It was crowded with massive electrical equipment. Six huge photon tubes, of a type new to him, were set up with reflectors, lenses, prisms, and filters arranged to focus their radiations upon the top of a small, black insulating pillar that rose from the center of the floor.

Upon the pillar, glowing with soft green, lay a small cube. Ivec moved to touch it. It looked real, yet curiously immaterial, like a two-inch block molded of some giant emerald's rays.

"Don't." His father stopped his hand, and found a pair of delicate insulated tongs with which to lift the cube into a padded case. "It is a frail thing, although so powerful."

His heart pausing painfully, Ivec whispered, "What is it?"

"It is a stable wave frame," his father said, "like matter, except that it is built not of electrons but of photons. It is pure light energy, fixed in dynamic balance. Half the output of all the power-field system has gone into this cube for the past year, Ivec. The en-

ergy in it, suddenly liberated, would fuse this mountain."

"What"—Ivec was dry-voiced with dread—"what is it for?"

His father's eyes came up, stricken again, tragic. The old man wet his lips, began slowly: "You know the history of travel in space. There are two difficulties that have never been completely overcome. The first is power. The velocity of escape from Earth's gravitation is about seven miles per second. No rocket propelled by known chemical reactions can exceed that very much. We have no available source of power sufficient to carry a human body on a successful voyage to Persephone.

"The second difficulty rises from the fact that the human body is very poorly adapted for travel in space. It is crushed by any violent acceleration. It perishes without bulky and elaborate provision for maintaining optimum conditions of temperature, pressure, and humidity; without heavy supplies of oxygen, water, and food. It is destroyed by the penetrating radiations and high-energy particles of space—which generate deadly secondary rays even from the lead walls designed to protect the passenger.

"The human body is deficient in sense organs for the needs of space travel, unless equipped with numerous and heavy instruments, all of which require additional power.

"Generations of effort have failed to conquer those difficulties. Most space voyagers have perished in their machines; a more successful few have returned to die on Earth, of their radiation burns."

"This green cube," Ivec put in breathlessly. "Is it—"

His grave father nodded.

"Since both those difficulties are connected with the limitations of the human body, I set about many years ago to find means to separate the essential part—the life—of a man from his body—

or, if you like, to devise a body without those limitations.

"The photon cube is that body. It is pure energy; all its weight is available power. It moves easily—by the mere readjustment of vibratory axes—for motion is the very nature of photons. The theoretical limit of its speed is only the velocity of light itself."

"I—" Ivec's voice was husky with dread. "I am to be—in the cube?"

Again the scientist nodded soberly.

"Your life exists as a function of the electric energy in the cells of your body. Nerve action is a progressive electrical discharge, conditioned by the dipolar moments and electrostatic tensions within the body molecules. Your mind is essentially a configuration of synaptic resistances.

"This cube reproduces, in its intricately interwoven vortices and stable wave fields, every energy potentiality of the human body. Every free electron in the body may be represented by a static photon quantum in the cube.

"With special conversion apparatus, I can drain the minute electric charges from your body—leaving it dead—and cause the energy to reappear in the balanced fields of the cube, which will then be alive."

"So my body," Ivec whispered, "must die?"

"It must," his father said softly. "But you will gain something to compensate the loss. You will be able to traverse space at will, and swiftly. Through field extensions, you will be able to cause physical effects in the space about you—to exert pressure, pick up and manipulate objects, set up sound or electromagnetic waves. You will be able to radiate your energy in controlled beams of almost any frequency."

Trembling, Ivec closed his eyes. His numbed fingers grasped at the cold, polished surface of a great inductance shield.

"But how, in the cube," he whispered,

"will I know anything? It has no eyes or ears."

"The cube is sensitive to light, because the impact of every quantum disturbs its own quantum structure," his father said. "It can see far better than your own eyes, in which the photons must act indirectly to produce chemical effects. It is sensitive to frequencies and particles that you cannot see.

"Its delicate structure is extremely sensitive to pressure and vibration—which means to sound. Its surface has a fine sense of contact and temperature.

"In a manner, the chemical senses, taste and smell, are lacking—because the cube contains no chemical elements. Yet its radiation sensitivity enables it to detect the chemical qualities of molecules. You will be able to *see* tastes and odors."

Hardly listening, Ivec stood looking at his father. Tears filled his gray eyes. A leaden ache seized his throat, choked his whispering voice:

"So I must die—to give life to a machine?"

Soberly, his father nodded, said, "If you would put it so."

Ivec looked for a little space at the scanty grass at his feet, and then down the tumbled, rocky slope. He looked into the valley's blue haze, and upward toward the far, cragged summits, dark against the scarlet sunrise. Soundlessly, his lips said: "When?"

"I knew you wouldn't fail me," his father said, relieved. "The conversion apparatus is in the main laboratory. I must tune and adjust it. I shall be ready in—an hour."

"I'll be there," Ivec promised. He looked back at the sunrise, whispering: "An hour to live."

### III.

WHEN his father had gone, Ivec Andrel stood alone on the bare mountaintop. He sucked lungfuls of the cold,



*Upon the pillar, glowing with soft green, lay a small cube.  
It looked real, yet curiously immaterial—*

dry air. Could the cube sense the fragrance of pines? He followed the thin, white thread of a road in the distant valley, traced the minute saw teeth of trees on a far ridge. Could the cube really see?

Drawing himself erect, he ran light fingers over the smooth, swelling muscles of arms and shoulders, touched his hard, flat stomach, the firm curve of his jaw. He swung forward on the balls of his feet, joyous in the elasticity of his legs. He extended and flexed his hand. He grappled with the appalling fact: in an hour this body, that seemed to be himself, must die.

Movement caught his eye. He saw Thadre Jildo, in hiking boots and black-and-scarlet tunic, striding along the mountain rim. Her fair skin glowed from exercise; the sun flamed against her copper hair.

He knew abruptly that he loved her. All his years seemed suddenly a tragic loss. There was, now, no time for love. But he turned and hastened to meet her, swelling his chest with the cold, invigorating air, rejoicing in every fragment of sensation.

A splendid way to die, he thought briefly, in joyous strength until the end.

"Ivec!" she shouted delightedly at sight of him, eagerly advancing. "I hiked to the point to watch the sunrise. It was terrible and glorious—even though it means the nebula is near."

Her sparkling eyes scanned his lean, athletic figure.

"You look wonderful," she said. "You really are a magnificent animal." At that word she flushed a little, bit her crimson lip. "I'm sorry, Vec," she said contritely. "I've often been sorry we quarreled before you left. Will you forgive me—for striking you?"

"Of course." He smiled at her. "It's awfully good to see you again, Thadre. Even if it's just for a little while." Despite himself, he had to gulp. "I

won't be an animal much longer, you see. I have just an hour."

Her blue eyes came slowly to his face. "Ivec," she said in a low, sober voice, "don't you think my uncle deserves the opportunity to make the trip to Persephone?"

He caught her arm. "Please don't start that," he said. "I just talked to Barthu, in the laboratory. He was unreasonable. If my father has chosen me to go, I shall."

She flushed. "The Andrels stick together."

"So, evidently, do the Jildos." He caught himself, jerked his head. "I'm sorry, Thadre. Don't let's quarrel again. You know about the cube?"

"I helped your father set up and test most of his apparatus, and filed all his notes."

"In an hour," he told her, "I must go into the cube. My body will die. Before that happens, I want to tell you something." His voice sank earnestly. "Thadre, I have always loved you, I think. Now I want—"

"I know what you want!" She tried to fling his hand from her arm. "When you have stolen the opportunity and the honor that were rightfully my uncle's, you want my sympathy, my love. You want the rewards of a hero before you have earned them."

She tried again to break away, but Ivec held her. With an unconscious strength, his hard fingers dug into her arm. She looked at him defiantly.

"Listen, Thadre," he said grimly. "You are very beautiful. I just said I always loved you. But just now I don't approve of your behavior—any more than your uncle's."

"Now, when the world is in danger, this jealous, selfish squabbling about personal honors is criminal. Pride is all right—if it's justified. You are all right. But your uncle hasn't earned the responsibility he wants—and he isn't worthy of it."

The girl stood rigid, facing him in bleak hostility. She was breathless, pale. Her attitude stung Ivec to another attack.

"Let me tell you something about Barthu Jildo. He is a coward and a maniac. He was terrified when he first learned of the nebula. He was afraid to die. He began a series of experiments with his own body, seeking to change its chemical constitution, so that it could endure the age of cold and survive forever.

"Those experiments failed, of course. More than that, they injured his body and his brain. He knows that his body is doomed, whether the world escapes the nebula or not. That is one reason why he wishes to escape into the immortality of the cube.

"His mind was disturbed by the effects of those rash experiments. My father believes that your uncle is not only useless, but dangerous to society. My father would have petitioned long ago to have him summoned for treatment or elimination—if I hadn't begged him not to, for your sake!"

Trembling with anger, the girl gasped, "Let me go!"

Ivec released her, silently.

"You are the mental defective, Ivec Andrel!" she stormed. "You've let jealousy warp your mind. You know you can never beat my uncle's brilliance fairly, so you attack his sanity. You are cruel—despicable—"

He grasped her quivering shoulders, looked into her eyes.

"You don't believe what you're saying, Thadre, honestly?"

"I do," she cried. "Let me go!"

She broke free again, and ran sobbing away from him, toward the laboratory.

IVEC sat down beside the trail. The mountain fell very sharply away beside him, its gaunt, rugged slopes scattered with stunted juniper and naked boulders. Aimlessly, his eye followed the

white road in the valley, the far, serrated line of pines.

The joy had gone out of him. For a long time he sat thinking of his crowded youth, his many visits here, his arduous years at the lyceum. He had waited long for the time when he, also, could serve. Now it had come.

A slow eagerness came to him. After all, this was the supreme adventure. To assume a new and wondrous body, fashioned of light itself! To go flashing away into the void, where man had never been! To visit the Sun's most ancient planet, on an errand of unguessed peril!

Against that, what was the loss of his body? What that a girl had scorned him?

He rose suddenly to his feet. He had been sitting a long time; the hour must be gone. He must go back to his father, make ready for the conversion.

He looked upward at the sky, bluer now, sun-drenched. The waning Moon was pale and low in the west. A sudden elation throbbed in him. To go flashing out there, a being of light itself—what could be more supremely expressive of life?

"To-day," he whispered, "I shall be going out there, past the Moon—and on!"

He was startled by the abrupt, harsh voice of Barthu Jildo.

"Not you, Andrel," it mocked him. "I am the one to go."

Puzzled, Ivec looked along the path in both directions, peered over the rim. He failed to find the speaker.

"Here I am," came the voice again. "Don't you recognize the body that your father fashioned for you?"

It dropped out of the sunlight, hung in front of his face—the small cube, shining with a pale, steady green, as if molded from the glow of translucent jade.

Ivec gasped, "How—"

"I persuaded your father that I was

better entitled to this privilege than you." The cube bobbed up and down, six feet before him. He heard a mocking laugh. "He was difficult to convince—but I left him still living."

Ivec clenched his fists, voiceless with fury. His eyes abruptly narrowed. He tensed, leaped, grasped for the cube. It bobbed elusively away.

"Thadre warned me of your anger," said the voice. "But now I am stronger than you, Andrel. At will, I could release energy to vaporize your body in an instant—"

"Thadre!" Ivec choked. "She knew of this?"

"Thadre Jildo is loyal to her name," said the voice of the cube. "She ran the conversion ray, to transform me." The cube danced higher, a green jewel in the sun. "Now I must leave you, young Andrel. I must go to Persephone, to obtain the key to material energy. In this cube my life may well be immortal. That secret might make me the eternal ruler of Earth."

"And never again will an Andrel—or any other man—be placed above Barthu Jildo. I promise that!"

"Thadre!" Ivec's voice was stricken. "She didn't—she couldn't have done this—"

"But she did," said the voice of Barthu Jildo. "I promised her not to injure the body you prize so highly. But I am not responsible for the force of gravitation."

Ivec was standing nerveless, dazed. It doubled the tragedy that Thadre had been involved. He was unconscious of any contact or pressure against his body. But, suddenly, he was floating upward, as if weightless. The sensation was giddily unpleasant. He snatched vainly at the bush beside the path. His body drifted across the precipice, over the steep slope below.

"Farewell, young Andrel," came the jeering voice. "I must leave you now, to find the secret—"

"You must go," cried Ivec, urgently. "Destroy me if you will. But you must find the energy catalyst, and bring it back in time to save the world from cold!"

"Don't you think," inquired the mocking tones, "that I shall be more eagerly welcome if I return after many have perished. After all, four billion are more than I need to serve me. But farewell."

The green cube flashed upward. And Ivec Andrel fell, unsupported. He plunged forty feet, to the rugged slope. His broken body rolled limply down across the naked rocks, until it caught against a juniper snag. It hung there, quite still.

#### IV.

"IVEC—Ivec, can you hear me?"

The distressed voice of Thadre Jildo came to Ivec Andrel as he lay on the mountain slope. He became slowly aware of his body, one bruised mass of dullly throbbing agony. He tried to move, but his body was an inert and helpless burden of pain.

He was able to open his eyes. He saw Thadre over him, her dry eyes dark with pain. The aërodyne was on a ledge behind her.

"You did—" The sobbing whisper of his voice set a new agony flaming in his chest. "You did—"

"I did it, Ivec," she said. "I converted my uncle to the cube because I believed he was the one who deserved to go. And because"—her white face went rigid with pain—"because I wanted you to stay."

She gulped; her eyes glistened suddenly.

"Forgive me, Ivec. I didn't know then that he had injured your father. And he promised me not to hurt you. I was a proud fool. Please forgive me—"

She was on her knees beside him, sobbing.

Ivec closed his eyes; his pain-grayed face was grimly tense.

"My father is alive?" came his agonized whisper. "Can he make another cube?"

"He will recover," the girl said. "But there wouldn't be time to build another. It took us a year to build No. 3. That is the one my uncle took."

"Three?" he gasped. "There are—others?"

"Nos. 1 and 2," said Thadre. "They were preliminary attempts. They are weak and unstable; the wave pattern is flawed. They can't lose much energy without breaking down. Your father said they weren't fit for the journey to Persephone."

"Take me," he whispered, "—laboratory."

As tenderly as she could, she began to gather up his limp, crushed body, to lift him into the aërodyne.

"You couldn't stand it," she said, choked with pity. "Your back is broken, and many bones. I must take you to the doctors. I'm afraid you—you're dying."

"Because of you," he gasped bitterly. Consciousness rocked to the searing pain from his chest. He coughed weakly, spat scarlet froth. "Take me—to my father."

Dark oblivion came to ease his agony as she was lifting him into the aërodyne. When painful awareness came back, she and his father were carrying him into the laboratory, on a stretcher. His father's head was bandaged, his thin face blood-smeared, haggard with pain.

The girl was saying, "—made me bring him."

Ivec caught his breath, forced out the gasping whisper: "Put me—in other cube."

His father said nothing until he was motionless in the cool quiet of the laboratory, and Thadre had made some in-

jection into his arm that seemed to clear his fevered mind, to ease his pain a little.

"Please," he gasped again. "Barthu is selfish—mad. Wants to be—a god. He will destroy—mankind. Let me go—stop him—bring back the catalyst—"

"DON'T SPEAK," his father said gravely, standing beside him. "Let me explain the situation. I know that Barthu Jildo's mind is mad; mankind had better perish than submit to his rule. But I'm afraid that you could accomplish nothing, in either of the other cubes."

Ivec whispered, "A chance."

"I don't know," his father said. "The conversion itself is very dangerous. Even when the subject is in perfect health, it is uncertain. With an old man, or a sick one, it would surely fail. That is why I cannot go."

"Even if you survived the conversion, both the remaining cubes are very much inferior to the one Barthu took, in both energy reserve and stability. It is not certain that either of them would be able even to reach Persephone, without collapsing."

"The odds were greatly against success, even with No. 3. The approach of the nebula's energy fields will make the outward voyage very perilous. It will be impossible for even the best cube to return, after the system has actually been engulfed in the cloud."

"Don't forget that the cube is merely a construct of photons that are always tending to break out of field vortices, as radiant energy. It hasn't the stability of matter. The impact of the nebular particles, or of any high-voltage quanta, will tend to break it up."

"But let me"—Ivec gasped from his couch of pain—"try!"

His father's haggard face smiled somberly.

"Consider the difficulties, my son. I have explained those that come from the

imperfection of the cube. It may not be able even to reach Persephone. I think its energy reserve is insufficient to allow it to return at all.

"Another danger is that from Barthu Jildo. The photon body he took is superior to the others in every respect. His mind is yet brilliant, for all its warp. He will certainly oppose any attempt to take away his prize. He will have the power, and the ruthlessness, to destroy you.

"But most difficult is the third problem—of obtaining the details of the catalytic process. Since atoms elsewhere in nature do not break down in the peculiar way which we observe in the Blue Spot, I am sure that the process there is being controlled by intelligence. That intelligence will probably fear and mistrust seekers of its power. I believe that it will be hostile. And in the material-energy process it has a dreadful weapon."

The old man's bloodstained face was very grave.

"I want you to understand, my son, that between the three dangers—the cube's instability, the insane hatred of Barthu Jildo, the hostility of the masters of Persephone—your chance of success is near mathematical zero."

"Still," whispered Ivec, "let me try. Not quite—zero!"

His father's haggard face was briefly lighted with a weary joy.

"No Andrel," he said, "has yet been beaten by a Jildo. I shall make ready No. 2."

## V.

IN A POOL OF PAIN, Ivec Andrel lay on a black, padded table in a darkened inner room. Massive electrical mechanisms loomed about him. A tube glowed dimly here in the shadows; there a bright surface gleamed. The sharp pungence of ozone was min-

gled with the smell of antiseptic from his bandages.

The photon cube rested upon an insulated stand near his bed. It was not clear like the other he had seen, but murky, flickering. It was like the ghost of a great emerald, but flawed, about to shatter under some inner strain.

His new body. Anyhow, he thought, the agony would soon be ended.

"A few moments," his father said softly. "Lie still."

His father wheeled a bulky, darkly glistening instrument over him, a similar one over the cube. Thick cables connected them, coiled away to other mechanisms.

His father whispered, "Now, steady."

A shrill, whining hum; an intermittent purple flicker of electricity. The ozone stung his nostrils. A white, blinding needle stabbed from the machine above toward his face, from the other toward the small green cube.

"A needle ray of positrons," his father briefly explained, his voice calm, soothing—yet somehow betraying a private doubt, an agony of strain. "It is deflected back and forth by magnetic fields. When a positron strikes a free electron in your body, the two are annihilated, with the creation of two-million-volt quanta. Thus your body is scanned.

"The photons are trapped in special field cells, equipoised in stable wave systems, and projected into the corresponding position in the vortex web of the cube. Thus your life is transformed from the electron energy of matter to the quantum energy of light."

The scientist had been busy with adjustments as he talked. The whining had changed, grown keener; the white needle had grown thinner, sharper.

"You are ready, my son?"

"Yes," gasped Ivec. A new wave of torture came up from his broken body. He coughed feebly, sickened by

the terrible flow of blood in his torn lungs. Through scarlet foam, he whispered, "Hurry."

A rapping on the door. Then his father's voice: "It's Thadre. She wants to say good-by."

"No," breathed Ivec, bitterly. "This —her fault. Go ahead."

His father touched his hand, as the black bulk of the machine descended. The whining grew sharper still. The white needle thrust toward his head. He closed his eyes, but its blinding radiance burned through the lids. Then, a thin blade of white agony, it probed into his brain.

A darkness struck him, heavy and thick as a physical wave. It drowned his senses—all save the sharp, thin pain of the stabbing ray. The darkness was shot with patches and zigzags of colored fire. A confused roaring ebbed and flowed. His whole body floated, as if on a river of roaring power.

Once he tried to move, to escape that probing needle. But his body was numbed, powerless. He relaxed into that black river—an instant or an eternity, he never knew. Then he had a vague, brief sense of dual identity, as the darkness and the roaring slowly faded.

He was one again. Light was about him once more. The thin agony of the ray receded, and abruptly he was aware of his surroundings.

He lay, naked and without pain, upon a smooth, hard surface. The dark bulks of the machines hung above him in the gloom, but they had shifted in position, so that the second, which had been upon his right, was now on the left.

He looked beneath it for the green cube. He saw the wheeled table, instead, with his father tenderly spreading a sheet over a supine, rigid form—a shape terribly familiar—his body.

With a clearing intuition, Ivec was suddenly aware of the cube as the home of his being. Vividly, he sensed each

jewel-smooth face, each straight, sharp edge. He somehow felt the tumultuous, uneasy stir of the imprisoned photons within it, the pressure of restrained energy processes. He was aware of the soft radiation flowing out, of his own control of it.

He dimmed the soft green rays, with an effort of will that soon became unpleasant—like the effort, in his old body, of holding the breath. He made them flare intensely, and again felt pain, as if from exhaustion.

"Careful, son." His father stood straight, above his sheeted body. "You will soon master the control of the cube—field tensions and vibration axes are directly responsive to your will. But remember your limitations. You have but a certain stock of energy, and when that is gone you will have no source for any more.

"You must be cautious. Any violent or sustained exertion, any severe shock or strain, might disturb the delicately balanced dynamic tensions of the cube and cause its sudden disruption.

"Now try to move—at first just slightly. The effect is attained by shift of wave axes and disbalance of vector forces. But you need be aware only of the effort of will and the resulting motion."

"Thank you, father. I will try."

Ivec was aware that his effort to speak had created a vibration of the entire cube, which set up sound waves in the air to carry his words to his father.

He tried to lift himself. The cube rose with the thought—a paper thickness—an inch—three feet. He soared over the great machines, poised, settled very softly upon the sheeted, stiff form that had been his body—this morning so joyously strong, now broken, useless, dead.

But this body of photons was splendid, also. It responded to his will with the speed of light. He lifted one of the

conversion machines half an inch; it must have weighed a ton. He focused a beam of energy on a metal shield, heated a little spot to cherry red. And a sharp, bright pain almost cleft the cube.

Dizzily, he was aware of his father's grave warning: "Remember, energy loss can shatter the cube."

THE DOOR flung open. Thadre Jildo burst into the room. She stopped abruptly, her fair face white and dreadful, a stiffening hand at her throat.

Her voice whispered, huskily: "It is over?"

The old scientist nodded without speaking. She moved, came slowly across the room, her face stricken, set. She paused beside the sheeted body on the table, her lifeless eyes looking dully down at the photon cube lying like a great flawed emerald on the breast of it.

The cube stirred, quivered, as conflicting emotions surged through Ivec Andrel. He loved this girl—despite what she had done, for all that he was dead. Regret ached in him that he had refused to tell her good-by. An eagerness burned in him at her presence—and a leaden bitterness of frustration quenched it.

His voice spoke her name tremulously: "Thadre!"

She burst into tears at that, dropped beside the wheeled table. Pressing her face against the sheeted body, she sobbed wildly: "Ivec! Oh, my Ivec——"

Ivec, in the cube, rocked to the horror of ultimate frustration. Her quivering breast was against the glowing emerald surface. With a savage effort of will, he fought the dreadful yearning for the life of his own body again, to comfort the girl.

Softly, he slipped away, saying: "Good-by, Thadre, father. Good-by!"

The girl looked up at the cube with a cry of startled horror; then dropped

her face again, weeping. His old father stood bowed and silent, his eyes dark with compassion.

Ivec fled away from his dead body, the weeping girl and his father. He flashed through an open window, out into the air. The sunlight was a golden river. He floated in it, drifting upward.

For a little time, high over the laboratory, he paused. It was a little rectangular block, its metal walls silver and red upon the flattened mountain ridge. But his keener senses were still aware of his father and the girl, prostrate with grief.

A throbbing ache impelled him back. But there was nothing he could do. Their grief was for his body, and his body was dead. This cube was to his father merely a complex machine, to the girl apparently a thing of strangeness and horror.

His mind came back to his mission, which was greater than himself and his private loves.

His new senses were immediately aware of the vast, dark curtains of the nebula, like an ominous storm cloud, rushing upon the solar system. He could sense keenly the relative positions of the Sun and the nearer planets, and he could perceive, even in daylight, the brighter stars.

Persephone, his unthinkably distant goal, was far beyond the ken even of his sharpened senses. But he knew its position among the visible stars—near red Antares, in the Scorpion. With a last look at his father and sobbing Thadre Jildo, in the laboratory, he lifted the cube toward it with increasing acceleration.

## VI.

STRAIGHT WESTWARD, Ivec Andrel flew, wingless, at the speed of his will. Away from the red morning Sun, toward the sinking, ashen disk

of the waning Moon. The laboratory, the mountain, fell away behind. His range of vision vastly increased; the Earth became visibly convex.

Yet, to the delicate light sense of the cube, visual detail remained amazingly clear and intimate. With a wistful longing, an invincible sadness, Ivec looked back at the world of man—from which he was, now, forever, an exile, yet which he must spend his life to serve.

The bright roofs of lodges, where people came for rest and sport, were numerous in the green and gray of the mountains. Upon the plain beneath spread the green fields and orchards whose delectable fruits would forever rival the synthetic products of the chemists. Irrigation canals made a silver net; between them the tending machines moved almost intelligently.

The roadways were white, straight ribbons, where endless streams of vehicles flowed. He traced the long, unbending pencil of the vacuum tube, upon its spidery supporting towers.

Above the valley, yet far beneath the swiftly ascending cube, he saw the bright teardrops of pleasure aërodynes, floating, soaring, drifting with the wind.

As far as his vision reached were scattered the industrial city buildings, each a great pyramid structure, white-walled, green-terraced, with the factory space within and beneath the living apartments.

As he flew higher—or as the curved Earth fell away from the straight line of his flight—the Pacific came into view. The vast, swelling curve of it was minutely indented with waves, like hammered metal, and the terminator beyond was a sweeping arc of darkness.

The coast crept back beneath him. He saw a great city, spread for many miles along the beaches and far up into the hills. The great communal buildings, of varied shapes and colors that

formed one artistic whole, were set far apart upon green, rolling park lands.

Vehicles were thick along the streets and roadways. He sensed the busy stir of life within the buildings, the swift intercourse through tubes and beltways beneath the parks. Above all, the aërodynes were flashing, like colored drops in a living fountain.

Far out upon the sea's sun-glinting blue convexity, he saw the white streamlined shapes of freight vessels; and the white walls of the floating cities, crowned with the feathery green of palms.

Vastly high above them, but still beneath the cube, hurtled the slender, silvery hulls of the rocket stratoliners, flashing from continent to continent.

A huge, diffused elation came to Ivec, to see all these evidences of busy, happy life. Power was the key to the splendor and the life of this modern world—power created by coöperative effort, and freely available to every man.

His vision found the endless gray dikes of the tidal power plants along the coast, the far-spreading black rectangles of the solar-electric plants in the desert lands behind him. His new senses could even perceive about him the energy of the planetary power field, that maintained all the activity he saw—that fed the life of the world.

All that was doomed, if he failed.

His mind saw the coming of the cold: The Sun grew red, was swallowed in endless night. Frost blighted the crops; snow blanketed the stricken world from pole to pole. The seas chilled and froze. The aërodynes fell, for want of power. The weather-control system failed, and icy blizzards raged upon the cities. For a time the buildings were lighted, warmed, with the small reserve of power. Then the lights went out. The planet, at last, was dark.

The dead face of Thadre Jildo was looking at him, its white loveliness frozen in a beseeching appeal. She

seemed to matter more than all the world. He tore his mind from that vision of death. He must not fail. No matter what the odds, he must not.

HIS FLIGHT carried him higher. The ionized upper layers of the atmosphere dropped from about him, wrapped the Earth in misty blue. In the new hard blackness of the sky, the stars shone minute and bright. The Sun's rays and the cosmic radiation came with a stinging, painful force against the surface of the cube.

Ivec was aware of the nebula again. The nearer octopus-shaped spiral he had already seen, ice-blue with cold, reflected light; its streamers had already touched and reddened the Sun.

Beyond that, his new senses detected the major cloud—so vast that the solar system, plunging northward at twelve miles per second, would be lost in it for a hundred years. A black and ominous wall of menace, it blotted out the northern constellations.

He must return before it reached the system, or the cube, helpless amid its charged particles and tremendous energy fields, would be lost, destroyed. Ever more swiftly, he flashed ahead.

The swelling Moon had changed from a pallid, ashen disk to a sphere of blinding white, its craters and pitted plains harshly rugged. It grew swiftly. It was beside him. The frozen Earth would look like that, he thought, after the nebula was gone—cruel, bright, lifeless—if he failed.

With the Moon dwindling behind, he increased his speed again. The effort of motion now brought a gnawing, inner pain, that kept him ever conscious of the cube's instability. Every expense of energy, he knew, must increase that agonizing flaw. Yet there was no time to spare; he tried to go still more swiftly.

The sunlight, cosmic radiation, positrons and other high-energy particles

made a continual painful rain against the surface of the cube. Speed increased the pain of their impacts on the forward face. Enough of them, he knew, could shatter the cube.

Mars was in conjunction—lost behind the red, diminishing eye of the Sun. He crossed its orbit, flashed onward toward the region of the asteroids. He shifted his path, to cross to northward of the ecliptic plane—knowing that a violent collision with a material object would certainly disrupt the cube into a flare of radiation.

Jupiter, which was receding from opposition, he passed within ten million miles. An object of superb splendor, its white, swift-spinning sphere oblate, dark-belted, marked with the glowing red spot, encircled with its family of swinging moons.

Ivec was puzzled briefly at the apparent rapidity of its spin, at the hurtling velocity of the moons. Then he realized that, as a result of his speed, now tens of thousands of miles per second, he was experiencing the Lorentz-Fitzgerald contraction, and the associated time extension. Precious time was rushing away, unsensed.

Saturn, Uranus, Neptune, Pluto were all far from opposition; space was now open before him to remote Persephone, which was still invisible. Again he tried to increase his rate of motion, as much as the mounting agony from the cube's instability would allow.

He was ever aware of the nebula's advance, made apparently swifter by the retarding of his own sense of time. It spread across the constellations like a monstrous living thing, its sprawling black tentacles reaching out to seize Sun and planets.

Again and again he had encountered stray wisps of its cloud—streamers of its dusty particles, whose impacts brought him dazing pain, forced him to slow his speed. But the greater danger fell upon him without warning.

He was, he knew, beyond the orbit of Neptune—although that planet, nearing conjunction, was five billion miles away. The Sun had dwindled to a minute disk that, through the haze of the onrushing nebula, looked red as a droplet of blood. The Earth was long since lost.

Yet he was only a bare sixth of the way to Persephone. He was fighting the twin pains, from without and within, striving once more to increase his speed, when, abruptly, his orientation was blotted out.

The tiny red Sun, the cold and distant stars, were swallowed in a cavern of darkness. Seized with a river of energy that he could not resist, he was flung spinning away. Scarlet agony engulfed him, as terrific forces tugged and battered at the cube.

HE WAS trapped in a sort of cosmic whirlpool, he knew—a colossal vortex created by the motion of the onrushing nebula. He fought its mad current with all his power, struggled to maintain the stability of the cube and gain his freedom, before he was dragged into the maw of the nebula.

Charged particles, given tremendous voltages in the stupendous electrostatic fields of the nebula, bombarded him with agonizing, paralyzing force. He sensed flaming lights of weird and incredible colors. Numb, reeling, he was lost within the mazes of the nebula.

Once, when chance let him glimpse the Sun and a few southern constella-

tions, they flickered in strange distortion, as if seen in curving mirrors. Light itself was twisted, lost in the terrific fields that held him.

But at last, weak and faint from loss of energy, wrenching from the tremendous field strains, numbed and battered from bombarding particles and quanta, he struggled free from the great vortex. For a time he wandered, utterly lost in the vast clouds, held to a snail's pace by the resistance of the charged particles.

Then again, through a rift in the nebula, he caught the faint and reddened gleam of familiar stars. His orientation restored, he drove onward toward distant and unseen Persephone. Inimical radiations battered him. The treacherous suction of energy fields sought to drag him back into the monstrous cloud. He suffered agony from the increasing instability of the cube and the terrific demands upon its vital energy.

He was fighting, not for his own life, which had long since ceased to have any meaning or value in itself, but for the life of the Earth. Against the appalling darkness of the nebula, he saw forever the proud poise of Thadre Jildo's bronze head, her blue eyes laughing, or soft with affection, or flashing with injured pride; saw the graceful loveliness of her tall, fair body. She became to him the type and the symbol of the race of man. It was she whom he must save.

Onward he flashed, toward Persephone.

*To Be Concluded.*

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Next Month:

## AT THE PERIHELION

by Robert Willey

*A story that will grip and hold you because of the scientific authenticity of its calculations.*

# SOS in SPACE

## ***Hemmed in by two bands—cut off from both Earth and Mars. Cause: unknown!***

Aboard the Space liner *Antares*, Earthbound from Zarno, Mars, December 23, 2:05 p. m., Earth time.

General Message to Marsbound Ships: Area of electrostatic disturbance located in Fourth Quadrant, Sunline A-6, of unprecedented intensity. Believed to be caused by concentrated electron streams from Sun spots. Our main electric line was short-circuited and we are in total darkness except for emergency battery light. No danger. Tests by reflection of radio waves indicate that the band of disturbance may occupy the entire Fourth Quadrant. Suggest that Marsbound ships swing up into Third Quadrant to escape this electron band. That is all.

Captain Robert Bernshaw,  
per Sylvester O'Brien,  
Chief Radio Operator,  
S.L. *Antares*.

Aboard the Space liner *Sirius*, Marsbound from Chicago, Earth, December 23, 2:18 p. m., Earth time.

QX to S.L. *Antares*: Acknowledging warning of electron band in Fourth Quadrant, Sunline A-6. Thanks. Unofficial: What would they call you for short? Syllie?

Jerre McRoy,  
Chief Radio Operator,  
S.L. *Sirius*, W.L. 0.56 meters.

S.L. *Antares*,  
2:23 p. m., Earth time.

Unofficial to S.L. *Sirius*: My dear Mr. J. McRoy, if you are trying to be

funny, let me warn you that I have a temper as Irish as my name. I am six-feet two, weight 198 on the hoof—i. e. on Earth; on Mars, 75 Earth pounds—and am conceded the best boxer in Pilot Co. 24, Zarno. If you care—or dare—to look me up at Space Pier 24's gymnasium any time, say the word.

Hopefully yours,  
Syl O'Brien,  
S.L. *Antares*.

P. S. Say, are there any pretty girls left in Chicago? I haven't been there in two years, since being on the Venus-Mars lines. If you can slip me a visi-phone number or two, I'll forgo the duty and pleasure of knocking your sassy block off.

S. O.

S.L. *Sirius*,  
2:29 p. m., Earth time.

Unofficial to S.L. *Antares*: My very dear Syl O'Brien, you seem a very beligerent sort, but I'm not afraid of you. On Mars you would outweigh a man of 175 by only 7 pounds, which is hardly any advantage at all. However, if you'll get off your high horse for a moment, I'll explain that I'm simply a lonely human being looking for a little radio pal. Our third radio operator took sick on the space bends, and as a result the other two of us are on alternate eight-hour shifts, and, believe me, that's not funny. I've tried out one other chap as a radio pal—S.L. Vega—but all he could talk about was the weather, and Heaven knows there's no weather out here! In other words he bored me more than taking down the meteor and direction-beam

# by EANDO BINDER



*Millions of little violet lights danced helter-skelter, and every now and then there was a shower of white-hot sparks.*

reports. I'd like to try you out, Irish. What can you talk about?

Roamer of the Ether,  
Jerre, S.L. *Sirius*.

P. S. yourself. As for pretty girls in Chicago, your standards are probably much lower than mine, so I couldn't help you out. By the way, I understand a very charming red-haired girl has recently signed up at Space Pier 18. If you're interested, you can try working through a call to Co. 18, Chicago, and find out her ship and schedule.

J. M.

S.L. *Antares*, 2:37 p. m.

Unofficial: Dear Jerre, are you *Sirius*? Now that I've vented my Irish temper on you with that bad pun, I'm willing to call off the dogs and chew the proverbial rag. But since you seem to be a choosy sort, I suppose first of all I'll have to pass the test as to whether I'm boring or not.

Well, to start it off I'll give you some inside low-down on that electron band we're passing through. Our lights are still out—I'm reading your message by flashlight—but the electrician thinks he'll have the trouble fixed in an hour or so. Naturally, we aren't getting any directional beam signals, as we've drifted away off course, in a flat, un-powered arc. We're getting the meteor warnings on auxiliary battery power, like the radio—but they are useless since we're not on the course they apply to! All in all, the *Antares* is just blundering along, somewhere in the Fourth Quadrant.

It is very weird in a way, this passing through an electron band, which I understand is like a huge geyser of speeding electrons gushing out into space from a group of Sun spots on old Sol. I passed through a small one a year ago, but nothing like this, where our whole ship is glowing with an eerie purple light. From the side port window the curve of the hull has millions

of little violet lights dancing helter-skelter over it, and every now and then there is a shower of white-hot sparks, as if we had touched the end of a live wire.

Some of the passengers—we're carrying 245—were a bit scared and thought the hull was being pierced and that we were in peril. Captain Bernshaw, a fierce old impatient rascal—for Jupiter's sake, Jerre, don't let these asides slip into the official records; needless warning I hope!—got mad when timid souls kept pounding at his door, so he called a general meeting in the main salon and gave them a speech. It was a civil enough speech—for him—but I saw plenty of people flush under his veiled scorn for their fears. He plainly enough told them that we were in absolutely no danger; just entering an area of electrostatic disturbance. He likened it to St. Elmo's Fire, the phenomenon that sometimes occurred on sailing vessels in tropical regions of Earth. And he said it was harmless.

But I can't blame the passengers for getting a little worried. A general prickling of the skin has been noticeable since we've encountered the thing, and it's beastly irritating, to temper as well as comfort. It may account for my sudden rage—I was really mad!—when I got your first message. Anyway, it was just as Cap Bernshaw got through quieting their fears that the lights burned out, all over the ship at once!

That was quite a sensation! One moment light—the next an utter, intense darkness that you could almost feel. I'll admit it made me gasp. Then, a few minutes later, our eyes adjusted themselves and we were able to see by the light of the stars that came in the ports. And on the Sun side, Cap Bernshaw had the Sun shutters removed so that part of the ship was bathed in that too-effective illumination.

I had been in the crew's quarters at

the time. One of the officers came up from below and related that at least a dozen women had fainted in the salon, and a general mixture of moans and screams arose from all. Our engines began to splutter a little later, too—interference in the sparking chambers—and at present we are going along un-powered. We have the same velocity, of course, that we had when we hit the electron band—good old Newton!—but we are losing time and will be a number of hours late at our Chicago dock.

That is, I hope it will be just hours, and not a day or two. Yet if this damned fountain of electrons fills the whole Fourth Quadrant, we're going to be delayed plenty. The engines won't function till we pass out of it. If you're wondering how my radio wave is working through, with all this electrostatic interference, so am I. It may be that—QXN—stand by! . . .

Hello, Jerre, still there? If so, give me a power sig. . . .

O. K. The 5-minute break there was to take in an official message from Zarno. They report that the *Orion*, Venusbound, just emerged from a similar electron band out that way. Damned Sun spots seem to be raising general hell. Those electron streams, emanating from the Sun spots, which are like sores on the Sun, and spraying out into the solar system like a conical searchlight beam, are the things, you know, that account for the Aurora Borealis on Earth. And for the still more famous and brilliant Venus Glow. Seems the electrons mix it up with a planet's magnetic lines of force and produce ionization phenomena.

Have you ever been fortunate enough to see the Venus Glow during the so-called Cool Season—cool at 130 degrees!—from the latitude of Szosh-Kanso, near the north pole? A rare sight! As the great Venusian poet put it, "The robe of the cosmo-queen spec-

trum lined, shimmering in some celestial wind." Earth's vaunted Aurora Borealis is a candle to it.

Well, here I am going off on a bat about the Venus Glow; but, in case you're getting any wrong impressions, let me refer you to my first message. And my offer still holds good! Oh, hell, I didn't want to say that! I guess it's this rotten prickling that's giving me fits of temper. In fact, all of us aboard the *Antares* here are pretty jumpy from it, let alone the lights being out and the engines blotto.

Anyway, I note it is close to 3 o'clock, and my relief comes then. I'll just have time to take in a brief reply from you. That ought to be in keeping with your Scotch name. Besides, my fingers are getting stiff and the keys feel like pin-cushions. Well, did I pass the test, or did you fall asleep?

Syl O'Brien, S.L. *Antares*.

P. S. Did you say "charming" red-haired girl pilot at Space Pier 18? My boy, I've seen and met dozens of female spacemen—or spacewomen!—and not one, not a solitary one of them, was even remotely "charming." Space hags, every one of them—hard-bitten, cold, and ugly as Pluto. So, thanks for nothing.

Syl.

S.L. *Sirius*, 2:55.

Unofficial: You passed the test with flying colors, pal! Colors like the very Venus Glow itself! Sissy! That riposte about my Highland name drew blood, too, so when, and if, we meet, it'll be war! But in the meantime, let's be neutral and use up some more unofficial kilowattage. As luck would have it, my relief is at 3 o'clock also, so I'll be ready for your QX sig any time after 11 p. m. Au revoir—or, as they say on Mars, "Till separation ends."

Jerre, S.L. *Sirius*.

Time for a P. S.? About the red-headed "charming" girl spaceman, she

probably wouldn't want to meet you, either. I can just picture you as an overgrown gorilla with a squashed pan, one ear cauliflowered and the other frozen off from space-suit work, and with a voice like a Jovian Bellow Frog. Radio waves tell no tales! J. M.

*Antares*, December 24, 12:15 a. m.

Unofficial: Hi, Scotty! Pardon the hour's delay, but I just had a run of official QX's. Just got your O. K. sig in reply to my power QX, so I know you're there at the keys on the *Sirius*. We have to be careful, you know, that our unofficials get to each other. Cap Bernshaw is Scotch, too, and if he knew I was wasting a few watts on unofficials, he'd have me on the carpet. In fact, he'd stuff me right out the stern hatch, he's that fussy for discipline.

Anyhow, Jerre, here I am, and let's hear the news from you first. Is the *Sirius* going to to the dogs? Syl.

P. S. You left out one little detail of my description—I'm bow-legged! Now this "charming" space girl with the red mop—she'd be tall and gawky and bony, with a sour, chinless face, big, flabby feet, and a voice like a scratchy phonograph record. I know the type too well. Probably as lovable as a Uranian Cactus Rat. S. O.

*Sirius*, 12:23: Greetings, Shamrock! I'm not bothering to paragraph this, and you cannot bother doing the same, so we'll both save time and recording paper. I used to do the same when I had a typewriter—run everything together. News? No news here on this wagon, except that a young and sensitive girl passenger ran a fit of the usual space fear—her first trip—and caused some commotion before they could get her to the med ward for a dose of sleeping drug that'll keep her under for the rest of the trip. Remember in the old days—a century ago—before they really knew what it was all about, how peo-

ple used to get an attack of space fear and go crazy? Even though it was so long ago, and hasn't happened in the last century, I still shudder to think of that battered old liner that pulled into port with only one sane man aboard! But enough of that. Let's hear your news. There must be plenty more than I have. How's the *Antares* doing with the electron business?

P. S. Say, Irish, you sure have it in for space femmes, don't you? I'd laugh if you met the red-haired one and found out she was really pretty!

Jerre.

*Antares*: Got your message, Jerre. Stand by for answer later. Cap Bernshaw on a rampage. Loading me with official QXs. Will give you sig.

Syl.

P. S. Haw!

*Antares*, 3:15 a. m.: O. K., Scotty boy, got your return sig. Yes, I know it's three hours since last time. And ring me Saturn if it hasn't been the busiest, sweatingest three hours I've ever tapped keys on a radiotyper. Zarno wanted a complete report on what we've encountered so far, so Cap Bernshaw had me pour out all our troubles.

Jerre, things don't look so good. Our lights are still out! They were fixed for a while and then—blooey! out again! It seems this electron band is bigger than any of us thought possible. We're still in the thick of it. Engines blotto. We may be in for another 24 hours of this blasted skin prickling and sans light. I caught a few all-wave QXs on the automatic, and Zarno is calling all ships back till this clears away. Chicago, on the other hand, is routing some freighters via the First Quadrant, on long schedule, but ready at a moment's notice to call them back, if these lanes become blocked.

Cap Bernshaw is charging around like

a bull, shouting and roaring. He's worried. I understand he had a secret meeting of all officers and told them to be ready for emergency. He's put us all on extra duty, cutting our sleeping time. I don't mind that so much, though, because sleep is almost impossible anyway. Have you ever had your foot fall asleep and then come back to life with a million needles jabbing away? That's about how our whole skin surface feels, only worse.

Our hull outside is glowing hideously violet, with a constant pyrotechnic of sparks and zigzags of blue electricity. Something tells me we're charged with about a trillion volts, and if we happen to pass close enough to another ship—God forbid!—there would be some terrific exchanges of electrical energy, like a lightning flash from charged cloud to cloud. There's no ionized air here to conduct current, but enough free electrons serve the same purpose.

As the electrician put it, we've walked into an inconceivably large batch of static energy, and we might just as well be a stick of dynamite plunging through space. You're lucky I can't shake hands with you now, Scotch boy. All the static electricity that has gradually accumulated in me since we've entered the electron band would shoot over to you—like that! Result—a cinder formerly named Jerre McRoy.

Of course, our fuel tanks are safely insulated in their bi-vacuum cradles. All the feed pipes have been drained. We won't be able to start our engines till we've passed out of this cloud of electrons and waited for our charge to dissipate. That may be another 24 hours.

Probably no decent sleep in 24 hours! I'm glad I've got you to talk to, Jerre. I'm pretty jittery. Even the food tastes like it had volts in it—sort of sandylike. My radiotyper here is glowing like a turquoise. Lord, this general blueness

and sick lavender is getting on my nerves. How I'd like to see yellows and reds for a change. Even the red of our girl friend's top-notch. Say, come to think of it, you've harped about her quite steadily, and just why? There—have to cut it. More officials. Will sig you later.

Syl.

P. S. Do you know her? I'll bet she's your sister and you're trying to lure some man into her scrawny clutches!

S. O.

Unofficial to *Antares*, automatic recording: My sympathies for your predicament. Hope it will be less than 24 hours. The carrot-top girl, being a "spaceman" herself, probably wouldn't look at anything less than a first mate or captain, so have no fears. J. M.

*Antares*, 7:14 a. m., December 24th: O. K., Jerre, got your QXJM. The past 4 hours have been a nightmare. Official QXs by the dozen, mostly warnings to avoid the Fourth Quadrant, to Mars, Earth, Venus, and even Jupiter. You've probably had some of the rebounds from Earth. Is your ship cutting away from the Fourth? I timed your return power sig at 20 seconds—that's 2,000,000 miles between us. You're a long ways from the Third Quadrant, where you should be. How come?

Syl.

*Sirius*, 7:18: We've had a little excitement here just this last hour in finding that something is haywire with our instruments. We've been cutting toward what we took to be the Third Quadrant for 6 hours. But when we crossed a directional beam signal, it showed we were deeper in the Fourth! Syl, that electron band is playing bigger tricks than just unpowering and short-circuiting your ship. It has *bent* the directional beams! Either that or it has gummed up our instruments, even

though they're insulated to the limit. Anyway, we're off course, just like you are—about 5,000,000 miles. We're still powered, but we must be near the band you're in, because our radium-faced dials are shooting out inch-long sparks. We're decelerating at present. I don't know quite what Captain Rollway has in mind—whether he's turning back for Earth, or cutting for what he hopes is the Third Quadrant. How are things in the *Antares*?

Jerre.

*Antares*: If I could growl over the ether, I would. My second assistant operator is in the med ward in the throes of some damned fever, along with 26 of the passengers. That means half time at the radio for me. It seems to be some sort of nerve cramp induced by the high-tension field we're existing in. Cap Bernshaw is frankly worried now. No telling what hellish thing may happen if we don't have relief soon. We can't eat, sleep, or even sit still. You've probably noticed that I'm coming through in jerks. That's because my hands are actually twitching at the keys. How is my wave coming in?

Syl.

*Sirius*: Not so good. Your messages are coming through spotty, with letter gaps and static dots galore. My dials show your wave is coming in weaker every minute. It must be shot through with holes.

Jerre.

*Antares*: That's the way I feel, too—shot through with holes! And tomorrow is Christmas Day! The menu calls for a special chicken dinner with real vegetables and genuine fruit dessert, and not one synthetic concentrate. The irony of it! The one day out of our 35-day voyage that real food is to be served, no one will be able to eat it, for we have lost all but a pathetic ghost of our appetites. There is also sched-

uled a big party for the evening, with our second mate as Santa Claus, and a Christmas tree and presents, with all the other holiday trimmings! Funny how even after a century and a half of interplanetary trade and mingling, our old Earth customs and holidays hold good, even out here in this timeless, traditionless eternity.

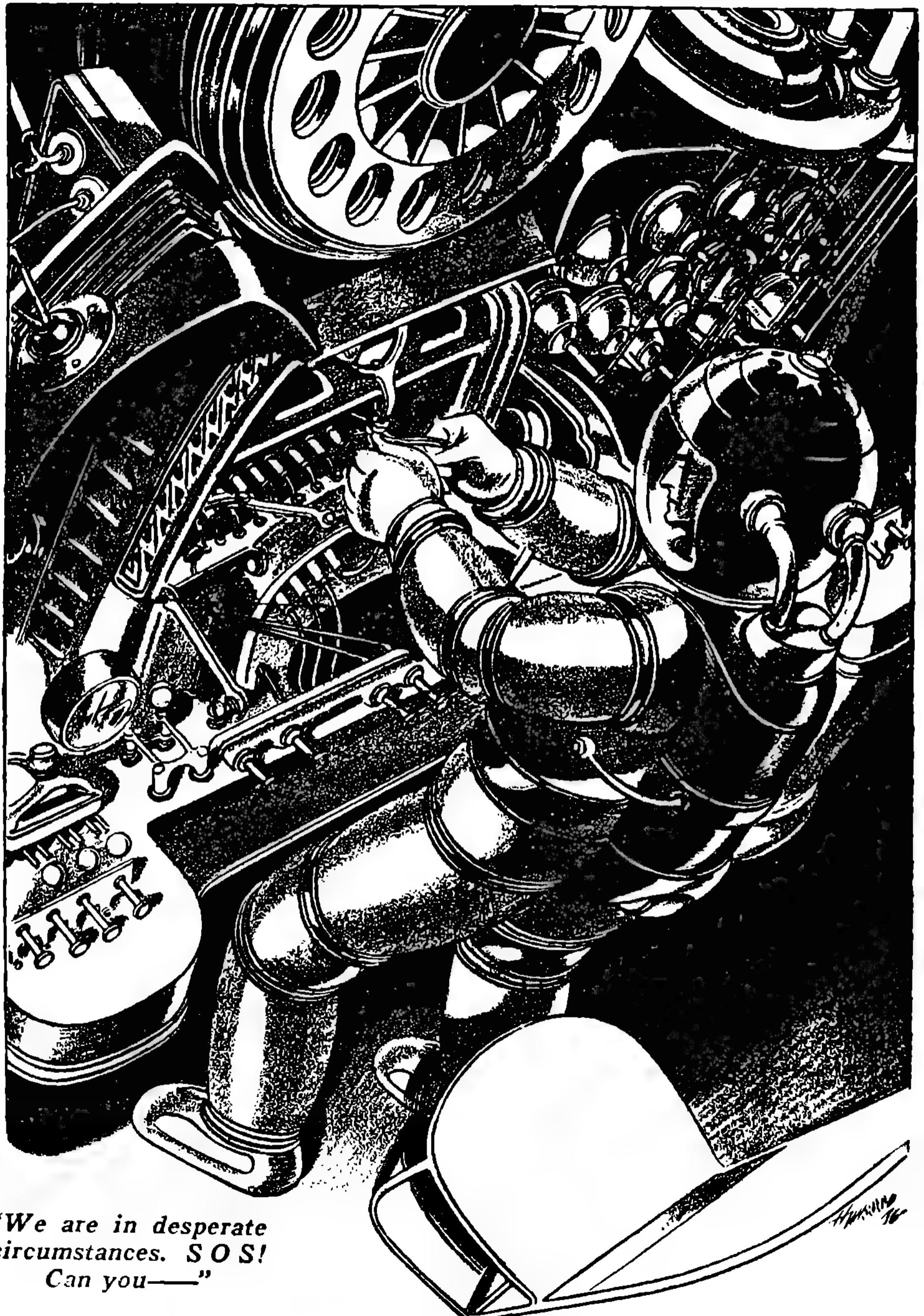
But I'm afraid it will be a rather grim Christmas Day for us, what with all of us on edge and unable to sleep or eat. Well, I see it's close to 7 o'clock, and that's when your relief comes, I believe. As for me, I'll be on duty another 3 hours. Then a 6-hour gap in which I'll stare at my bunk and try to imagine what sleep would be like. I'll give you a sig at—come on, brain!—at 4 o'clock. O. K.? Syl.

P. S. I have so many spots in front of my eyes that if I met this red-haired space Amazon right now, I wouldn't be able to tell if she were pretty or ugly. But I would bet on the ugly! S. O.

*Sirius*: Right on the 4 o'clock, Sylvester. Jupiter, but I sympathize with you and the rest on the *Antares*! It must be a mess of no fun. I hope we manage to skip by that electron band. If—stand by a sec. QXN, . . .

QX again. Just took a message off the automatic, from Zarno, relayed from a scout ship investigating the electron band. It says the disturbance is spreading! Seems to be filling the Third Quadrant, too! That completely blocks the lanes to Mars. And here are general orders to decelerate at double time, which means we are definitely turning back to Earth. Say, this is what they call an emergency! All ships ordered to turn back to nearest port. Officials beginning to come in, Syl. Let's have your sig at 4 o'clock. Jerre.

P. S. Glad to see you still have your sense of humor with you. As long as conditions on the *Antares* don't drive that from you, all's well. J. M.



*"We are in desperate circumstances. S O S!  
Can you—"*

*Antares*, December 24th, 4:05 p. m.: QX *Antares* to *Sirius*. Can you hear me, *Sirius*? Have been sigging for five minutes. QX—QX—QX! Answer immediately, *Sirius*! QX—QX—QX—

*Sirius*: RP—RP—RP—

*Antares*: O. K., have raised power. Can you hear me now, *Sirius*?

*Sirius*: Just about. This is Jerre. Thank Heaven we've regained contact. I've been waiting since 4 o'clock for your sig. One little power QX squeezed through a minute ago. Raise your power a bit more—too many letter gaps.

QXN.

*Antares*: Right, Jerre. Have raised power almost twice. Hope the tubes hold out. The *Antares* is more or less of a madhouse right now. Imagine close to 300 insomniacs wandering about in a weird violet glow that fills the interior of our ship. Our eyes are red from the bad lighting and from the blinding effects of the sparkling on the hull that reflects into the ports. Our hair is standing on end from electrification. The air we breathe reeks of ozone. Eating is out of the question. We're all running some sort of fever that makes our skin burn maddeningly.

Many of the women and children passengers are violently ill. Cap Bernshaw has converted the stronger men into a temporary hospital force. In fact, he has instituted a practical martial law. He is walking around armed, as well as five trusted officers. No telling what may happen among those badly frightened, tortured passengers. It's not a pleasant situation.

Our supply of battery light is running low, and for the first time in the history of this, or any other, ship, as far as I know, we have broken into the candle supplies and distributed them.

Candles are wasteful of oxygen, but we must have some light. Have you ever seen a candle, Jerre? Years and years ago they used them to decorate Christmas trees.

But we're not thinking much about Christmas here. All we're talking about is when we'll ever run out of this electron band and get our engines started. And become human beings once more! We've all lost flesh—some terribly. Those sick are in a delirium, or—perhaps—insane. Passengers are not as blunt-nerved and inured as space-men.

Lord! When will we run out of it? Since the Sun rotates on its axis, and must swing the electron band around with it, we ought to pass out of it eventually! Actually, of course, since the Sun rotates in 25 days, we should have been out in a few hours. But Sun spots have a habit of coming in chains, so the band is a continuous series of flaring cones along Sunline A, intersecting the space between Mars and Earth in the Third and Fourth Quadrants. The irony of it is that since we are aimed for a post opposition and speeding Earth, we have almost the same relative velocity from Mars that the electron band has. The cursed thing has actually been tagging along with us, like a leech, for 6,000,000 miles!

And I'm afraid it has cut us off completely from Mars, both physically and by radio. QXN—stand by—I'm going to try to contact Earth or Mars stations. . . .

4:21: QX. No go, Jerre. The only contact I have right now is with you, and at binormal power. I had Zarno about 3 hours ago. Then it flicked out as though suddenly choked off. That damned electron band must be like a holeproof wall between this sector and Mars. The strange part of it is, though, that I haven't been able to raise Earth, either. Have you had

any radio trouble? The control man insists our set is all right, and is functioning perfectly, but he must be wrong.

Syl.

*Sirius*: Syl! He's probably right! And our control man must be right, too, because we lost contact with Mars three hours ago, and with Earth right after that! The electron band that you're passing through has now completely filled the Third and Fourth Quadrants, a solid interlacement of cones 10,000,000 miles wide between us and Mars! I've determined that by timing the rebound echoes of my own power signals on long wave, which have no penetrative power and must reflect from the limits of the band. Right?

Jerre.

*Antares*: Yes, but that doesn't account for Earth being cut off through the First Quadrant.

Syl.

*Sirius*: Earth? We're cut off from Earth in the same way! Didn't you get the ace-emergency QXX from Chicago at 12:30? That there's another region of disturbance centering in the First Quadrant, Sunline B! Jerre.

*Antares*: Good Lord, no! No such warning came through at all here! I had a suspicion—Jerre! That means we're hemmed in by those two bands! Cut off from both Mars and Earth! Any chance of your ship cutting into the Second Quadrant?

Syl.

*Sirius*: No—too much velocity. Stuck we are. The last 6 liners scheduled to leave Earth were held. And the last 5 from Mars also. The *Antares* and the *Sirius* are the only two ships en route at present. Better notify your captain of this immediately. Jerre.

*Antares*: Right! QX you later.

Syl.

*Antares*, 5:03; Official: Captain Bernshaw of the *Antares* to Captain Rollaway of the *Sirius*. Since the electron bands have cut off communication to both Earth and Mars, the *Antares*' position is extremely precarious. We will make one more attempt to start our engines, as we are now getting clear of the electron band we have ridden through for the past 2 days. If our engines do not respond, suggest that you, being under power, swing ship toward us immediately. In the case that we are unable to get our engines started in the next 12 hours, my passengers must be transferred to the *Sirius* before this delay makes it impossible to intersect Earth in its orbit. The fuel reserves of the *Antares* will be sufficient to power the *Sirius* in a transquadrant course to escape the electron bands. That is all. Bernshaw. QXN.

*Sirius*: Will swing ship immediately.

Rollaway.

P. S. unofficial: Funny how unemotional words can be, isn't it, Syl? Captain Rollaway's eyes were deeply worried as he read your message. He thought a long minute; his eyes grew tortured. He can't ignore Captain Bernshaw's appeal—it is that?—but every delay means danger. What is your position at present?

Jerre.

*Antares*: Fourth Quadrant, Sunline D-9, 14 power days out from Mars, and 2 cursed days of coasting. We're just about at the mid-point. You must be rather close to our position; I've timed your replies at 10 seconds. About 1,000,000 miles. We'll be close enough for phone contact soon. What's your present velocity?

Syl.

*Sirius*: We've been decelerating at triple time for the past 6 hours. Our speed with respect to Mars is about zero now. The last order we received

from Chicago was to head back for Earth via the Second Quadrant, which at that time was clear. Heaven knows if it is now! Something tells me, Syl, that both our ships are in a tough spot.

Jerre.

*Antares*: Tough's the word, Scotty, but never say die. I hope to live to see this crimson-curled Venus who roams the spaceways! It does look, though, that we're between the devil and the deep, if the electron band has closed in at our backs like a trap. First Quadrant, Sunline B, eh? That's bad. The Sun's rotation, and therefore the swing of the band, is faster than Earth's orbital movement. That means it is inevitable that the Second Quadrant will be closed to us, if it isn't already. Lord! I hate to think of our ship having to cross another band! At the end of it we'd be counting the dead and—insane! We could, of course, simply hold our ships in the clear area—in which you now are—and wait for a path to open. But by that time Earth will have gained more in her orbit than we could make up with our limited fuel. Worst of all, M-rs w--1 -y -h-- --e—

*Sirius*: QX *Antares*! You have flicked out. Give me power sig. Standing by, QXN.

*Sirius*; 5:46 p. m. QX—QX—QX—  
—*Antares*! Please answer—QX—  
QX—

*Sirius*, 7:00: *Sirius* calling the *Antares*—QX—QX—QX—

*Sirius*, 9:00: *Antares*, please answer!  
QX—QX—QX—

*Sirius*, 12:00: QX—*Antares*. QX—*Antares*. QX—

*Antares*, December 25th, 12:06 a. m.: Ans-er-*ng* QX *S-ri-s—S-1*.

*Sirius*: It's time! You've been ether dead for 7 hours! What happened? And by the way, Merry Christmas! Jerre.

*Antares*: Yes, Merry Christmas. A very Merry Christmas. Big explosion in the fuel hold at 5:08 yesterday! Cause unknown. Results: lower stern completely ripped out, at least a dozen lives lost, all instruments dead, rest of ship badly strained. Repaired radio in space suit. Ship threatens to fall apart any minute! Forced oxygen supply is keeping up pressure, but won't last long. We are in desperate circumstances. S O S! S O S! Can you—

*Sirius*: *Antares*! Go on! . . . *Antares*! If you can hear, but can't answer, hang on as best you can. We are coming for you! Your radio signals check only one second—80,000 miles. Can you give a power sig?

Jerre.

*Antares*: QX—QX—QX—

*Sirius*: O. K., no time to lose. Give me power sigs every 10 seconds. As soon as we've orientated our position and speeds with a direction finder, we'll approach. Sig!

QX—QX—QX—

*Sirius*: O. K., distance 72,000. Shouldn't take more than an hour to—

QX—QX—QX—

O. K., 3 degrees, 7 minutes off Sunline—

QX—QX—QX—

O. K.—

*Sirius:* O. K., we're swinging ship! We have your approximate direction. We'll transfer you inside of a hour. Hang on! Oh, Lord! If you could only talk to me. Syl—

QX—QX—QX—

O. K., clipped off a few miles already—

QX—QX—QX—

O. K.—

*Sirius:* O. K.—hurray! We've just sighted you! You're a tiny pin point of glowing violet there in the star field. All of us here are praying we're in time. You are growing rapidly. We'll be up to you in a jiffy, make contact, and—

"Blow yourself to hell! This is Sylvester O'Brien talking by phone. I have a beam on your aerial. Connect up."

"Hello, Syl! Jerre talking. Jupiter, but it's good to talk for a change, instead of banging radio keys. Ready for rescue?"

"Ring me Saturn, yes! But tell your captain pronto that we're dynamite. We're charged with electricity like a thunderbolt. Tell him to have your ship come only close enough to spear across a line—say 500 yards. The vacuum in between will protect you then. We will have our passengers

come across in space suits—into one of your locks. They will discharge themselves individually by touching metal.

"Tell Rollaway to hurry! You see, our only chance to escape the two electron bands that are closing us in is by going up out of the plane of the planets. Rise *above* the bands, which lie side by side in the plane.

"That's why we have to hurry, because after we reach free space, we have to make a bee line for Earth's orbit and intersect it before Earth gets there, or else! This is still Christmas Day. We ought to have the poor old *Antares* emptied by midnight, and be on our way. That's about the margin of time we have. Got all that straight?"

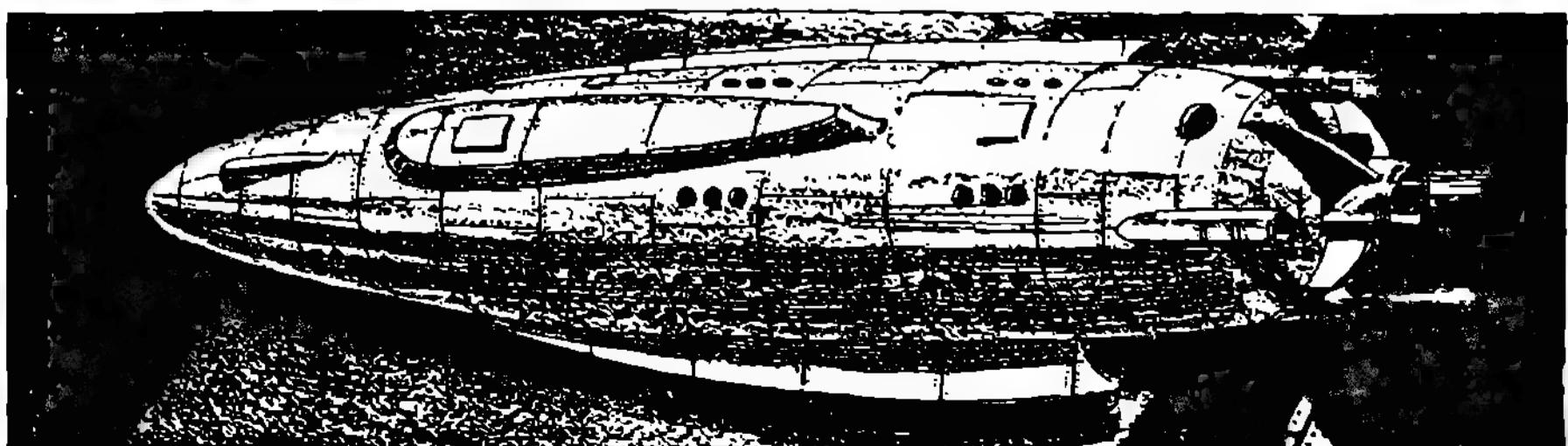
"Yes, Syl. You sound very weak. Are you—hurt?"

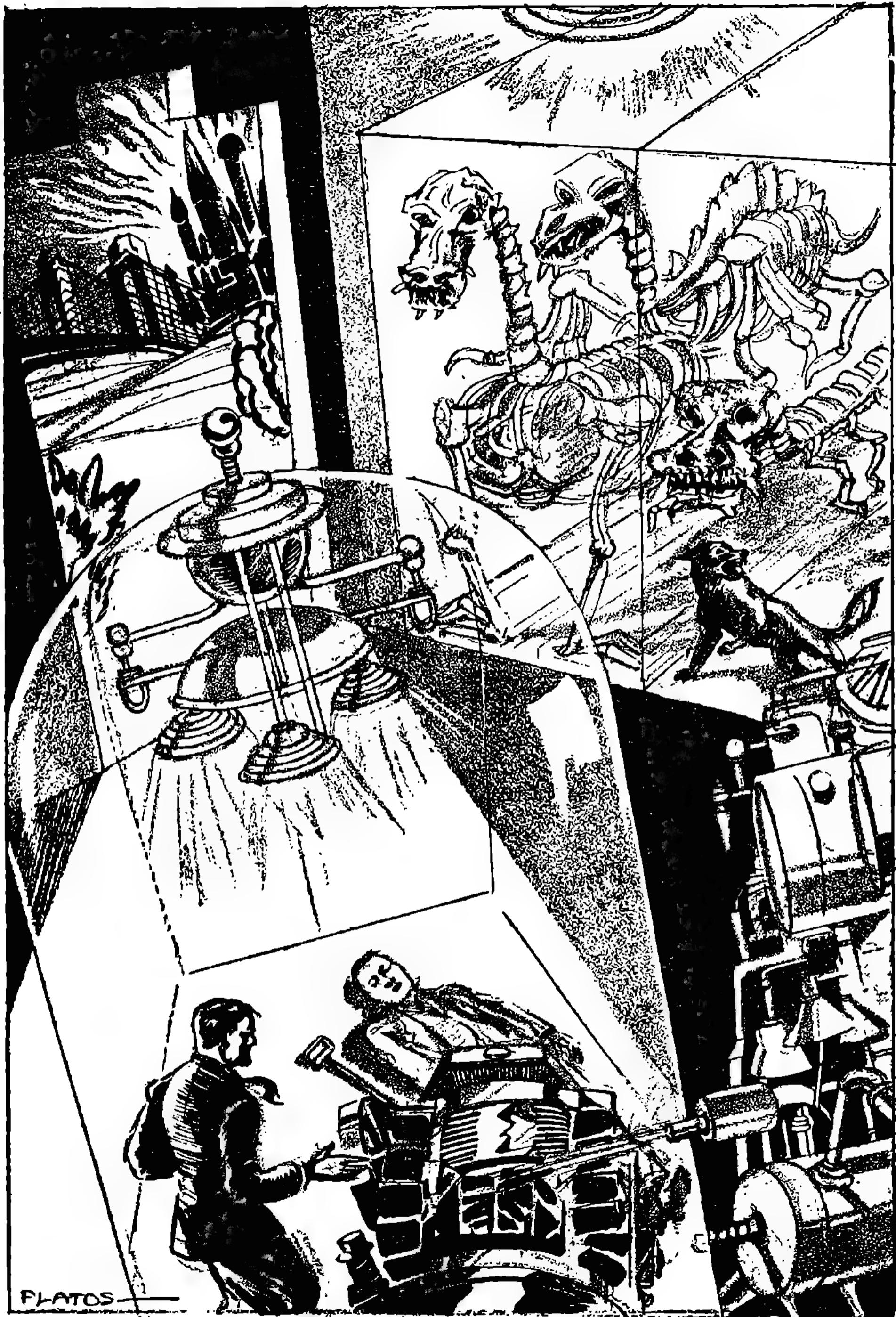
"Sort of, Jerre. I'm turning the phone to my assistant, in fact. Say, your voice sounds high-pitched. Are you nervous?"

"I—I guess so. Anyway, Syl, I'll expect to see you in person soon. Come right to the radio room when you get across."

December 25th, 11:45 p. m.: A haggard-faced, tall young man, with his broken arm bandaged to his chest, entered the radio room of the *Sirius* and asked for Jerre McRoy. He stared in bewilderment at the young and pretty red-haired woman who rose smilingly to greet him—stared—stuttered—held out his good hand.

"How are you, Jerre?" he asked.





*A little whimper gurgled in his throat. He knew the truth  
now—knew just what would happen—*

# Luminous Mine

*Titans moved about it—running this rich plunder of Earth into molds*

by Raymond Z. Gallun

**D**RIFTER" TANZ raised his shovel cautiously. For a split second it poised in mid-air, while he aimed his blow. Then it arched downward, gaining speed and momentum. The thud it made when it struck was almost like that of an impact with soft earth.

Drifter Tanz stepped back. Ivan Huzarski's body didn't fall at once. It swayed like a big tree whose trunk has just been severed. Then it folded at the knees and sprawled, twitching, at Tanz's feet. The top of its head was flattened. Blood welled darkly through a matting of flaxen hair. The unlidded eyeballs of the corpse reflected little specks of amber moonlight.

The young murderer smiled bleakly. "Sorry, Ivan," he muttered. "We're both stingy as hell. If we had tried to share our luck, there would have been trouble, sure. Osmium, radium, iridium; copper, lead, gold—and the devil knows what else! It's unbelievable, but true. The ground I'm standing on is loaded with rare metals. I'll be rich, Ivan; but I won't embarrass you with too much publicity. You'll get a nice, quiet, desert funeral!"

Tanz laughed. Then he looked around, just to be doubly sure that there was no one in sight. There wasn't, of course. Beyond the rim of the broad, craterlike depression in which he stood, a rolling plain extended in every direction, cactus-dotted, and here and there marked by a grotesque hillock. The moon made everything an unreal jumble

of silver light and ebon shadow.

Except for the battered caterpillar truck that had brought him and his now dead companion to this remote part of the great southwestern desert, he might have thought himself magically transported to another world. Maybe some lonely prospector crossed this spot once in ten years, but not more often.

However, in spite of his satisfaction over the knowledge that Huzarski was now out of the way, the youth felt uncomfortable. Mystery has that sort of effect on human nerves, and there was mystery here aplenty.

Drifter started to dig a shallow grave in which to hide the corpse of the murdered man until he could find a better place for it. When the job was about half finished, the will-o'-the-wisps appeared. He called them that because he had no other name to give them. He had seen them the night previous from the camp Ivan and he had pitched less than a quarter of a mile from the spot where he now stood. He had expected them to appear again to-night, and he had not been mistaken. He was here in this shallow depression that had cupped them twenty-four hours ago, and now they were all around him, filmy and dim, but real beyond possibility of an error.

Considering their faintness, it was not difficult to understand why no desert wanderer had ever reported their existence. True, they may have been noticed often in the past; but many strange tales sift out of the desert and are soon

forgotten. Thus real and miraculous fact may sometimes be lost in the flood of pure fancy.

THERE WAS no heat in the will-o'-the-wisps. They streamed up from the crater's rim, and from the dusty soil of its bottom, like long, wavering threads of St. Elmo's fire. Dim, beautiful colors rippled and shifted in them: soft greens, slumberous reds and blues, that mingled fittingly with the mellow magic of the moon. The wisps made a soft, rustling sound, like a drape of silk in a vagrant breeze. High in the air they extended, forming a luminous cone whose peak leaned toward the southeast, and was diffused into invisibility at some indefinite point in the depths of the sky.

Yes, Drifter Tanz felt definitely uncomfortable. Here was something that was quite out of his experience, though his scientific education had been good. He cast nervous glances in this direction and that, as he finished Ivan's burial. High objects seemed to attract the greatest activity of the cold fire. Rocks strewn here and there at the bottom of the depression were fuzzy with its ghostly streamers. His own body was alight with the dim flame, and the truck at the rim of the pit was enhaloed like something sainted or bewitched.

What caused this un-Earthly phenomenon? Drifter Tanz wasn't superstitious. His reason told him that even the strangest phenomena can be explained by natural law. The dusty earth here was rich with radium. Perhaps its emanations caused a weird atmospheric fluorescence. But why had the will-o'-the-wisps come into being as suddenly as the snapping on of an electric light? To say the least, the circumstance was an odd one, presenting questions for which there were no tangible answers.

Tanz stood rigidly for a moment, to

recapture his lost nerve. His big, hard body was trembling a little, nor was the chill of the desert night responsible. Had he felt entirely free to do so, doubtless he would have bolted. But the promise of great wealth can strengthen a man's will beyond its ordinary limits. There was no doubt that there was wealth here. Already Drifter had committed murder to establish his sole claim to it.

Now Tanz threw his shovel aside, picked up a handful of the dust at his feet. Idly, he let it sift through his fingers, from one palm to the other. Minute, metallic specks glinted in it. They reflected the moonlight, but the lunar rays were only a secondary cause for their luminescence. Cold fire enveloped each speck of metal, like the aura of a magnificent jewel.

As Huzarski had proved to-day with his tests, those tiny grains of brightness were bits of fabulous mineral wealth. There was gold in that dust, and osmium, iridium, and radium, not to mention copper, lead, and traces of other rich metals. They were alloyed together in those minute specks. But each was chemically uncombined. There were no oxides, chlorides, or other compounds here.

This, in itself, was a minor mystery. Most of these metals were known to occur commonly in the native state, but not so lead. In nature, it almost always existed in chemical compounds alone. And radium was normally derived from an ore called pitchblende, most of which is uranium oxide. Only in uranium ores was radium found, and the quantity ratio between the two was always constant, being one part of radium to 2,940,000 parts of uranium, which represents the balance between the rate at which uranium decomposes and that at which radium decomposes. But now the fixed rule had been broken. There was no uranium here, or at least very little.

'And this was not pitchblende that covered the floor of the crater; it was nothing but desert sand!

YOUNG TANZ possessed a vivid imagination. Perhaps it was because of this that certain associations of ideas occurred in his mind that would not have occurred in the mind of a more stolid person. It was the will-o'-the-wisps that had attracted Ivan and himself to this crater in the first place. That the metals were to be found only in the crater over which the wisps hovered hinted strongly that there was a definite relationship between the presence of the metals and that of the wisps. But this wasn't all. How had the crater been formed?

Drifter cast a troubled glance toward the sky, where, in the southeast, the planet Jupiter hung, dimmed by the moon. Then he shrugged and cursed. There was no sense to think of vagaries when engaged in the practical investigation of rich mining ground. But he could not quite rid himself of the odd feeling that he was being watched by alien and inimical unknowns.

He moved forward through the tenuous flame. A dozen steps he made. Then he felt the ground shudder under him. Automatically, he leaped back, but he could not get out of danger. A section of the crater's floor had collapsed. Amid sand and dust and rocks he slid downward. At first he clutched frantically at the loose soil to save himself. But there was nothing for him to cling to. And so he held his arms up to his face to protect his eyes.

Dry, powdery stuff closed over his head, and still he went down deeper into what might have been quicksand. He was sliding along a fairly solid surface now, his body enveloped in a mass of dusty débris. At last, scratched and bruised and imbedded, he came to rest. The avalanche that surrounded him had

been the thing that had saved him from serious injury, cushioning his tumble, which had been at least a hundred feet in extent.

Wriggling, he got himself free from the encumbering stuff. Wispy streamers were thick around him now, like a host of imprisoned spirits. He peered about the eerily glowing cavity in which he found himself. It was narrow and high, and without regular form. The bottom of it slanted steeply. Little trickles of sand, and fine, floury rock, which must have been pulverized by a tremendous impact at some time, still rustled down the slope.

Drifter could see what had happened. Accidentally he had stepped on the place where the cavity almost penetrated to the surface of the desert. His weight had caused a cave-in. Now the avenue by which he had achieved an unwilling entrance to this place was completely blocked by sand, powdered stones, and rubble. He was trapped!

Panic came over him in a chilling wave. He groped for the knife at his belt. He drew it out of its scabbard, and attacked the barrier that barred his way to freedom, digging furiously. But after a few strokes, the once-stout blade snapped.

IN A DAZE he looked at the broken fragments of the weapon. Instead of being bright and shiny they were pitted and gray, as if they had been dipped in a powerful acid! Something in the air around him was dissolving the steel of the knife! The wispy fire clung to the broken pieces like the flame of ordinary combustion clinging to the wick of a candle.

Impelled by an unpleasant thought, Tanz drew out his watch. It, too, was corroded in the same way. And it was no longer running. Its mechanism was doubtless too gutted to function. The metal buttons of Drifter's clothing were

also rapidly dwindling away, enveloped by the same unnamable, luminescent phenomenon.

The man crouched where he was for a full minute, gripped by the spell of sheer terror. Then, responding to instinct alone, he once more attacked the jammed mass of stones and powdered rock that held him prisoner, swinging the hilt of the knife, and the piece of the blade still attached to it, with wild fury. The powdered rock yielded easily, but more of the loose, treacherous stuff at once took the place of that which he dug away.

It was some time, though, before reason checked Tanz's insane efforts to escape. Panting and sweating and trembling, he desisted. Such activity was worse than useless, for it sapped his strength.

Still he could not just crouch here and wait for death, which would come to him by way of starvation and thirst, if not in some more ghastly manner.

He looked down toward the lower end of the cavity. It slanted on, forming a jagged passage which seemed to angle tortuously into the depths. Its walls were of pulverized rock, the surface of which was sufficiently crusted so that they did not collapse.

His gaunt face a mask of fury and fear, he shook his fists toward the eldritchly illuminated depths of the demon pit. "You won't get me!" he shrieked. "Whoever or whatever you are, you won't get me!" His outburst ended in a dry sob.

Then Tanz rallied. He felt ashamed of himself for being childish. His jaw hardened, and his cruel, gray eyes lost their wild gleam. He meant to solve the enigma of this weird place, if to do so were at all possible, and he meant to turn the solution to his advantage if he could.

"Take it easy, you damned fool!" he hissed.

HE SURVEYED the downward passage briefly. Its formation seemed natural, and yet not quite natural. The roughness, and the uneven waverings of its sides, clearly denied that it had been drilled by a machine of any sort. Nor did it seem to be of volcanic origin. Nor was it a tunnel made by the action of water. Aquatic erosion produces fairly smooth surfaces. There were few of these in evidence here. The passage seemed instead to have the form of a vein of ore, which, in some cryptic way, had been dissolved out of the surrounding earth, leaving the latter intact! Only a dusty ash remained of whatever mineral had once filled the tunnel.

Tanz did not try to theorize on the questions which the mystery presented, for it seemed evident to him that there were still facts in the case that he had not yet learned—facts which were within his reach.

Moving very cautiously, he began to descend that twisted passage. For what seemed hours he continued on down through the murk of cold flame, his eyes always looking for signs that would help him to understand.

In the crusted, floury rock of the tunnel walls he saw the same kind of metallic specks that Ivan and he had found in the sand of the crater bottom above. But now, careful scrutiny revealed something new to him. The specks were not permanent; some of them dissolved in the cold fire that enveloped them, while others seemed to condense out of that fire like minute drops of dew, only to vanish from sight again after a few moments.

This had not happened while Ivan had been testing the metallic bits taken from the crater's floor; but that was before the ghastly luminescent phenomenon had been started. And his own scrutiny of the handful of sand he had picked up after burying Ivan had been too brief to reveal the peculiar disappearance and

reappearance of the specks, even if the process had been going on then.

Vague ideas were swarming unbidden into Drifter's head; thoughts of such things as ions in an electrolytic solution. Was there perhaps some comparison between the motion of those ions under the influence of an electric current, and the alien processes going on here? If electricity were passed through a solution of copper sulphate, copper was deposited on one electrode. If the direction of the current were reversed, copper was deposited on the other electrode, and the copper originally deposited on the first electrode was gradually reabsorbed by the solution.

The analogy, if it was a real one, was far-fetched. Drifter only knew that to a savage mind the simplest processes of modern chemistry would seem almost as awesome as the heatless fire and its strange effect on metals seemed to him.

At last his long descent brought him to a large hollow pocket deep in the crust of the Earth. What he saw there checked for a time his rambling ruminations. Imbedded in its bottom was a circular disk, seven or eight feet across. It might have been the end of a large cylinder. Its color was greenish, but its sheen was definitely metallic. Around it, streaming up in a bright, rustling haze, was a tremendous aura of the misty fire.

DRIFTER approached the thing warily; for he knew by intuition that here was the nucleus of the phenomenal cold flame. There was little to see. The disk was flat, with a smooth, burnished surface. At its center there was a circular area of transparent material. There were broad, metal fins at the edges of the disk. They were warped and scored as if by heat and friction.

Tanz brought his eyes close to the transparent area, and attempted to peer into its depths. He saw a cylindrical

chamber. The disk was the end of a cylinder then, as he had thought it might be. There were queer rods, grids, and vats in the chamber, and they were all enhaloed with wispy luminescence of many hues. But there was no visible sign of any living thing.

Tanz drew back. His hard, young face had softened a little with awe and puzzlement, as he tried to draw a definite conclusion from the facts he had learned. He was more of an adventurer than a scientist; but he had taken his college work seriously, and his vivid, explorative imagination had led him to pursue many strange paths of study.

Clearly, this cylinder had arrived here in some way. Above, on the surface of the desert, there was a pit, looking oddly like a small duplicate of the famous Meteor Crater. The rock under it was pulverized, even to this great depth, as if by the blow of a Gargantua. All evidence, then, seemed to indicate that this cylinder of greenish metal had been shot to Earth from somewhere in space. Its tremendous momentum had driven it far underground, pulverizing everything in its path. And here it was lodged, intact and functioning. That it was here for a purpose could not be doubted.

There were clues as to the nature of that purpose. The most evident of these was the flame's curious reaction with metal. Drifter was sure that this underground pocket, and the tortuous passage leading down to it, had once been a rich vein of ore. During its meteoric descent, the cylinder had crushed the ore just as it had crushed the surrounding rock, but it could not have altered the shape and the position of the vein itself to any great extent. It was the flame emanating from the cylinder that had dissolved the metal in the ore, leaving only an ashy slag.

The specks of alloyed radium, osmium, lead, gold and so forth, which

were visible in the walls of the cavity, were not normal metallic deposits; they vanished and appeared again under the action of the cold fire.

In time a scientist might be able to visualize the atomic details of the phenomenon; but Drifter had neither the time nor the necessary apparatus to make tests. He was therefore compelled to deal in bare facts, contenting his curiosity with dim theories. He knew that he had come in contact with wonders beyond the ken of modern man, but which, in the future, might well become commonplace.

Clearly, the fire dissolved metal into something else, not solid, and probably not gaseous. Perhaps at some step of a cycle the metal returned to its original form briefly, only to be reconverted once more into an intangible unknown that probably could penetrate solid material as easily as light penetrates glass. Perhaps that unknown was neither matter nor energy; perhaps it was on the border line between the two.

BEFORE beginning the descent of the passage, Drifter had thrust the hilt of his broken knife into his hip pocket. Now he groped for it experimentally, and discovered that almost nothing remained of it except the wooden handle. He tossed this useless remnant away. The metal buttons of his clothing had disappeared. His watch, when he investigated it, was only a small handful of corroded scraps. The knife hilt, the buttons, and the watch had just happened to get in the way of the flame.

"There's not a soul here except me," he muttered to the shadows that throbbed and pulsated on the jagged walls. "But this mine is being worked by some one—far away. Maybe it isn't exactly what we would call a mine. As far as I know, radium doesn't occur free and uncombined, at least anywhere near the surface. Maybe these heavy

metals are being pumped up from way down near the center of the Earth. Dense substances would naturally sink toward the center of gravity. We were fools, Ivan."

Drifter started. The miracles around him had almost made him forget, for an instant, that Ivan was not with him. The youth cast an apprehensive glance over his shoulder. All of a sudden he could remember Ivan very clearly: his broad, Slavic face, that gold tooth that used to gleam when he smiled, and most of all those dark, deep-set eyes of his. Drifter had been vaguely afraid of those eyes. They had been like the orbs of a devil—keen and cruel and hypnotic.

Young Tanz had not loved Ivan Huzarski; they had been companions only because they were of practical use to each other. But now Drifter would have found even Ivan's presence reassuring. He had murdered for wealth, and now that motive was only a mockery. There was plenty of wealth around him; but he was trapped and impotent, and faced by a grim unknown.

Presently there was a curious change in the throbbing glow that filled the cavity. Its activity seemed to increase, and the many hues that swarmed in it deepened, becoming a sullen red that was almost homogeneous. It was as though some instrument in the cylinder had detected his presence, and had relayed the information to a guiding intellect far away. Perhaps that intellect had responded with certain readjustments of controls.

The ominous quality of the light caused Tanz to step back. He saw holes appear in his clothing, though only metal had been attacked before. Then the red fire enveloped him like a cocoon. A searing agony stabbed into his nerves. He screamed. Was some entity, somewhere, testing the chemical composition of his flesh?

There was a moment of respite from

the pain, during which the ruddy flame thickened around him. Then the agony returned. His senses vanished in what seemed a sudden explosion of the very substance of his body.

VAGUE, SHADOWY LIGHT was around Drifter Tanz when he awakened. He felt the bite of a dry, brittle cold. The air was thin; it made him feel giddy as with altitude sickness.

He raised himself from the metal floor on which he had been lying, and crouched tensely on his haunches. He was in a large cage of transparent material. Suspended over his head was a system of strange grids which still radiated a faint warmth. Not many moments ago those grids must have been heated by a flow of some form of energy.

Near by, on the floor, was a heap of corroded junk. Drifter could see that it had once been his and Ivan's truck. The cold flame had done plenty of damage to it while it had stood at the edge of the crater. Beside the crumbling remnants of the decrepit vehicle, was the body of a man, and the wooden handle of a shovel.

Attracted by greater mysteries, Drifter peered through the transparent walls of the cage, which stood in a vast chamber. In the dim light he could see many machines of greenish metal. All but one of them was silent now. A small pump swayed lazily back and forth, forcing air into the cage with a hissing sound. The atmosphere outside was too thin, then, for human lungs to breathe.

Along one of the graystone walls of the chamber was a series of transparent cells or cubicles. Most of them seemed to be empty; but three were occupied. One of these contained numerous mounted skeletons, some of which were clearly of terrestrial origin. The latter were mingled incongruously

with the chitinous exoskeletons of monsters which could never have lived on Earth.

In another cell was a little doglike creature, alive and active. Beyond doubt it was a terrestrial coyote. In a third cell there was a man. Maybe he had been a prospector once, in the southwestern United States. But the magic of science had brought him here, perhaps many years ago. Here in this alien place he had lost his Earthly aspect. There was no clothing to cover his scrawny, withered body. His beard was long and tangled and white. His lips curled as he uttered idiotic mouthings; and in his face was the blank stamp of hopeless insanity.

Drifter studied the fellow with a kind of blurred, uncomprehending wonder. At the moment the youth's emotions seemed curiously and unnaturally subdued. Presently his attention drifted on to the openings in another wall of the chamber. Whether they were windows or doors, Tanz did not know; but through them a bizarre scene was visible.

In a very general way the aspect of the view was quite terrestrial. There was sky; there was ground; there was vegetation; there were buildings and machines. There were arid, rounded hills, showing sharp and clear in the distance.

But each of the details of the scene was given a bizarre, unfriendly twist, which made them inimical and depressing; and which conveyed to a human being a homesickness of an intensity impossible for him to feel in even the remotest corner of his native planet.

BECAUSE of the extreme rarity of the atmosphere, the sky was not blue, but a deep, midnight purple. Bright stars gleamed in it, though the Sun, diminished by distance to a tiny, corona-winged disk, was only a few degrees from zenith. Close to it was the thin

crescent of a gigantic, silver-gray planet. Scattered here and there about the planet were the smaller crescents of its many moons.

The vegetation here was low and leafless and dry-looking, like lichen. Shadows were sharp and dense.

There was a city out there on the plain—a city of black, twisted minarets and countless interlacing bridges which seemed almost as fragile as a spider web. On the bridges crept living creatures that were not human.

At the center of the city reared a tremendous tower of green metal. Its conical summit was enveloped in wisps of witch fire, which seemed to stream in from space, and to collect and solidify on its peak. At its base hot metal cascaded and sparkled, and mechanical Titans moved about, running this rich plunder of Earth into molds.

A little whimper, like that of a lost and weary animal, gurgled in Drifter Tanz's throat. He knew the truth now; but it was fuzzy and dim in his mind, and the emotional side of him did not quite grasp it. Perhaps this was because nature has provided human creatures with a psychological defense mechanism, which in trying moments of their lives imposes a limited check on dangerous realizations.

His reason told him that he was here, and that he would never see his old familiar surroundings again; but these were facts which his feelings refused to believe, as yet.

The blurred loneliness in him made him crave the companionship of his own kind as he had never craved it before. Since there was nothing else that he might do to relieve the intense longing, he crept over to the corpse sprawled beside the truck.

It was the corpse of Ivan Huzarski. Drifter recognized this fact without surprise. Its face looked peaceful and relaxed. There was sand in Ivan's hair,

hiding the blood; and there was caked sand, too, in his half-closed eyes, concealing their accusing, hypnotic glitter.

Tanz bent over the body, a frown of puzzled concentration crinkling his brow. His mind was trying to capture elusive reality.

"This is one of the moons of Jupiter, isn't it, Ivan?" he asked after a moment. "It must be, because that planet in the sky is Jupiter. None of the other planets has so many satellites except Saturn, which has rings, too."

The youth paused before he continued: "The—the big shots here needed heavy metals, which are probably rare way out here. The four big outer planets are all of low density, and though their moons are denser, still a lot of the heavier elements are probably missing in their composition. That was why the big shots sent the cylinder to Earth.

"The will-o'-the-wisps coming from it dissolve metals like osmium, radium, lead, and gold out of the Earth, probably drawing these substances from its core. That green tower out there in the city draws whatever it is that those metals are changed into, across space, and changes them back to their original form. Lighter metals are also subject to the same process, though maybe to a lesser extent.

"The steel in the knife I had was eaten up because it was in the path of the flame. The same thing happened to the truck before the big shots knew it was there, and to that shovel of mine. That's right, isn't it, Ivan?"

Drifter's tone was plaintive. "When I got close to the cylinder, something inside it must have put the bosses wise," he continued. "They must have discovered you and the truck and the shovel handle up on the desert, shortly after. Maybe finding me poking around made them do a little scouting in some mysterious way of theirs, just to see if I

had brought anybody or anything along with me.

"And so they used their science to bring us and our equipment to this place. It was the same kind of science that brought that coyote and that old lunatic over in those cages, here. It wasn't as easy to do as drawing metals across space. A different technique had to be used. We aren't made of just one element, but many; and they probably didn't want to kill me. Even the truck had a definite shape which they wanted to preserve intact.

"They probably dissolved our equipment and our bodies, not gradually, but all in one flash, to be sure that no complexity of form was destroyed. Maybe some day our scientists will be able to do the same thing when they understand matter and energy a lot better. Maybe they—"

A FAINT SOUND to his right checked Drifter's monologue, and caused him to turn. A machine like a tremendous beetle was there in the rusty shadows, its prehensile claws fumbling with the valves of an air lock which pierced the walls of the cage. Something rode on the machine's back, something about a yard long. It had no visible eyes or head or limbs, but its pearly, capsule-shaped body was furred with countless fine feelers. The thing's flesh pulsated as it breathed, and it directed its mount with cool purpose.

It entered the cage, and for perhaps a minute seemed to inspect the remnants of the truck. Then it approached Drifter and the body of Ivan. Young Tanz backed away, but the alien being did not pursue. Instead, the machine it rode picked up the crumpled form of the Slav, and started back toward the air lock.

This act produced a curious reaction in Tanz. Ivan Huzarski was dead, but he was nevertheless the last human contact that Drifter had with his old, pleas-

ant, roving life. With a fury that exceeded his fear he leaped toward the monster.

"Don't go, Ivan!" he shrieked irrationally. "That thing never could be a friend to a man. Not as much, even, as a snake could. Don't let it take you away! Don't!"

There ensued a gruesome tug o' war, terminated by a savage thrust from one of the machine's metal feet. When Tanz picked himself up, he was alone.

Stupidly he looked about at the alien things around him, the machines, the black, grotesque city under the sad sunshine, the arid, repellent hills in the distance.

"It isn't true, is it, Ivan?" he babbled. "It can't be real."

For many seconds he stood staring out at the city; but it was not the city alone that he saw. His reason was tottering. Ivan Huzarski had deserted him, even after he had tried to be friendly. He could no longer distinguish fact from fancy. Before him, hanging in space, he seemed to see a pair of dark, hypnotic eyes, cold and cruel. They were Ivan's eyes.

"No!" he screamed suddenly. "Nothing here is real! You're making me see all these things, Ivan! It's your revenge because I killed you! It's your revenge, damn you!"

Drifter's voice broke into peals of mad laughter.

When the native of this Jovian moon returned, he found only a maniac like the other he had kept for so long. Using a little spray gun, he anæsthetized Tanz, and transferred him to one of the crystal cages along the wall.

Perhaps the native was disappointed with the way things had turned out. Perhaps he had hoped that this subject would remain sane. Studying him would have been more interesting then. Perhaps even friendship of a sort might have been possible.

# Metamorphosis

*Not only annihilated inanimate  
matter—duplicated creation—*

by John Russell Fearn

WITH fierce, argumentative intensity the two men paced about Professor Draycott's expansive Californian estate. Draycott himself, fifty years of age and world renowned as a physicist, only paused occasionally to thump home some point with fist and hand, then waited whilst Dr. Andrews, his closest friend and partner, gave his opinion.

"I tell you, man, that the thing's dangerous!" Andrews declared at last, coming to an emphatic standstill. "Do you realize for one moment what we are proposing doing? Matter out of energy! I never thought before of the chance we're taking."

Draycott shrugged; his seamed face was confident enough.

"Listen, Andrews," he said quietly, "you've got to admit that matter and energy are pretty much of a puzzle, anyhow. I don't need to tell you that the universe is sparsely filled with matter. Here and there this matter formation is visible in the form of planets, human beings, plants, and so forth. I believe that once, and only once, there was an accident in space, an accident whereby a range of radiations far shorter even than those of cosmic rays—probably a wave of about one thirty-second of a million millionth of a centimeter—struck a mass of energy in space.

"I say 'mass' quite figuratively, mind you. That resulted in fusion, and matter was just born. I believe, too, that,

in the early stages, matter was alive and possessed of mentality, of an order we cannot understand. Later it formed into an outwardly expansive matter and finally exploded, producing the galaxies and scattered matter seas that we know as the expanding universe of to-day. When that explosion happened, certain of the radiations released reacted on the then inanimate carbohydrates of Earth and produced yet another form of life, which ultimately evolved into human beings.

"The real life that had formerly existed—some electrical form, no doubt—lost potency and became inanimate. To-day we know that unintelligent life as electricity. Nothing more. I believe that electricity is the *real* life of the universe. We are merely accidents, off-shoots of what was intended to be an infinitely greater power."

"I know all that," Andrews said.

"Maybe you do; but since you're feeling uncertain, it's perhaps as well to refresh your memory. Our calculations have proven that only a wave length of the order already mentioned could possibly change free energy into solid matter. I think, if we can do it, that we would find a form of matter exactly reproducing the one that originally formed the closely packed core that has now become the scattered, exploding mass of the universe."

"I still think we're taking too big a risk," Andrews muttered. "We're doing something that hasn't been done



*As Ranbury stood there, trans-fixed, the whole combination—woman included—congealed into a shapeless mass—gradually vaporized—*

since time began, and, frankly, I don't like the thought of it."

"My dear chap, one would think this was the first time you'd weighed the experiment up. You know as well as I do that our matrix will just stand the temperature we shall need—and only just, if our calculations are right, since it will mean involving a temperature of some two thousand billion degrees. We shall use copper for the experiment,

since it gives its energy freely, then, when it is finally annihilated into energy, it will be bombarded, before dissipation is possible, by ultra-short cosmic-ray wave lengths, identical to those which we believe brought the matter part of our universe into being. Of course it will be risky. What experiment isn't? But if it succeeds, think what we have accomplished! We shall not only have annihilated inanimate

matter but will have changed it into another form of matter altogether. Duplicated creation, in fact!"

"That's what is worrying me," Andrews responded dubiously. "I'm a scientist, yes. But I'm beginning to feel chary at trying to beat Nature at her own game."

Draycott sniffed. "Fine talk after years of assembling equipment, after endless hours of computation, struggle, and designing. Now we come to the crucial point your nerve is failing you. We have everything down to the last figure, even how to alter the wave lengths of inflowing cosmic rays to the required length we need. Why, you yourself invented that device, perhaps the smartest thing you ever did.

"First we draw the cosmic waves by electromagnetic devices, then pass them on to the transformer chamber. There they are subjected to perpetually varying electrical fields, generating tens of thousands of volts, which change the radiations ultimately to what we want. Thence they pass, the instant they are needed, to our matrix. And then, Andrews, you dare to flinch!"

Andrews shrugged. "Maybe I'm a fool," he admitted. "Suppose, though, there is a violent explosion that blasts not only us, but everything on Earth, right out of being?"

Draycott smiled with a certain fatalism. "If there is, we shan't need to worry over it, shall we? On the other hand, we may meet with success. I'm quite convinced that in electricity, in the terrible force of atomic energy, in the weaker and destructive wanderings of thunderstorms, in the strange power begotten of friction, there is a *something* —a something lying dormant that our experiment may bring to life. The things we shall tamper with will involve electricity of the *n*th degree, and if our conclusions on the beginning of the universe are correct, we are but the lowli-

est form of life, permitted supremacy only because our masters are asleep."

He paused and glanced toward the sunset.

"Getting chilly," he said abruptly. "Besides, it's time for dinner. Come."

THE TWO SCIENTISTS ate dinner with the same enthusiasm as they had always done. It was an agreement between them that at mealtimes they shelved all things scientific. But immediately it was over they retired to the laboratory and became men of action, once more.

"To-night!" breathed Draycott, gazing round at the bulky apparatus filling the half-mile expanse. "The night we've waited for all these years, Andrews! When we are to put all our treasured ideals and beliefs to the vital test! Smile, man—smile! It's a supreme moment. Even if it is to mean our deaths, we can only die once. Why not in so glorious a cause?"

The stoop-shouldered Andrews shrugged and looked doubtfully at the cold and silent electric furnace in the center of the laboratory.

"All right, let's go," he said simply, and with that proceeded to go through the actions he had performed in pantomime for months previous. This experiment was to be no mere haphazard stunt, no groping effort to wrest an impossible secret, but a skilled and practiced endeavor backed by unswerving knowledge and countless rehearsals.

Whilst Draycott placed the copper block, perhaps three inches square, in the matrix, and inclosed it with the specially designed pressure plates and sheathing, Andrews checked over his cosmic-ray machinery. In appearance it somewhat resembled a high-powered telescope, save that it was much more solidly built. Its far end poked inquisitively into the clear night sky through the opened roof. From long experiment both men knew the constant

prevalence of cosmic rays by day and night, but only they had managed to devise the necessary means to snare them.

At last everything was in order. The cosmic-ray transformer chamber was in position, completely linked to the furnace, ready for the vital moment. Draycott threw in the switches, then he and Andrews stood in silence and slipped tinted goggles into position over their eyes as a safeguard. Andrews bit his lip and stared fixedly at the apparatus; Draycott watched the specially designed furnace fascinatedly, swiveling his eyes only occasionally to the readings on the heat and pressure gauges.

Rapidly the air began to become hot and stifling. The two discarded their coats and collars, and stood looking very unscientific in their shirt sleeves. Higher and higher rose the temperature.

How long they waited they had no idea; they were too interested in their task. It was impossible to judge what was happening inside the furnace; they could only call on their scientific imaginations to picture the disruption of matter. In that there was nothing so very abnormal. Scientists had done this before, but perhaps not so thoroughly. It was the conjecture of the latter part of the experiment that gripped them.

Dead to the second, timed absolutely by the various meters, Draycott swung around to his switchboard again and proceeded to shift the vital controls. The cosmic-ray apparatus moved automatically into position. Andrews leaped to it, flung in the switches of the transformer chamber. The electromagnetic attractors glowed white hot. Then he looked up tensely, his eyes on the dials — turned and nodded a glistening face.

Immediately Draycott slammed in the master switch. At the identical second the composition of the copper within the furnace, passed into the pure-energy state, but, also, at that same, identical second there hurtled upon it the terrific

power of cosmic rays, focused into a single devastating convergence and shortened to one thirty-second of a million millionth of a centimeter.

The two men never beheld what happened after that. It seemed that the universe suddenly opened like a yawning, flaming abyss. They were dropped into the blazing maw of a terrific incandescence, all vestiges of life instantly blasted out of them.

Southern California heaved and shook in its entirety. For an area of a hundred miles around the Draycott estate the landscape rose and fell like a carpet with the wind beneath it, razing buildings to the ground in clouds of choking dust, burying the hapless inmates. The scientist's own residence simply spewed upward into the sky in a smashing mass of masonry, blasted outward *en bloc* by the violence of an incredibly powerful explosion.

Where the residence and grounds had stood there was naught but a two-mile-wide crater. But in the center of that crater, glowing as yet with fiendish brilliance and unimaginable heat, lay a heavy, rocklike piece of matter, the most remarkable matter ever known on Earth.

And with the passing of the hours, whilst people throughout the world, and in America in particular, rushed frantically to and fro trying to discover what had taken place, whilst meteorologists pored unbelieving over zig-zagged seismograph charts, the metal began to cool. But, even so, there were none who yet dared to approach within ten miles of it, none whose eyes dared to look, even from the air, upon its blinding grandeur.

## II.

IT WAS A WEEK LATER before the metal cooled, and one of the first on the scene was Gordon Wood, a New Yorker, scientific administrator for the

United States. This lean, industrious man with the clipped mustache and penetrating gray eyes, handled the problem with true scientific energy and regard for caution.

He knew that the meteorite, as it was then popularly supposed to be, might be extremely dangerous; indeed, in view of the terrific explosion it had caused, it was more than likely. He immediately had the scene of activity roped off, then waited whilst special freight cranes were sent across the continent from the research institute in New York City, whither the metal was finally conveyed in the grip of massive steel clamps, always kept well away from the possibility of human touch.

Since the substance was considered definitely in the meteorite class it was not altogether Wood's fault that he did not at first personally examine it. It was conveyed, when thoroughly cooled, for examination by the meteorite research department.

A young expert by the name of Stanley was assigned to conduct the investigation, but when, not two hours afterward, Wood was summoned and found only a pool of water where Stanley should have been, he began to suspect there was something very radically wrong. Questioning of various assistants revealed that Stanley had decided on examining the stuff on his own. He had cried out. Others had rushed in to find—a pool of water!

It was certainly no meteorite that could behave in so deadly a fashion. Wood had it transferred by special apparatus to his own quarters and there, in company with his colleague, Nick Easton, began a specialized and careful study.

"It's darned funny stuff, Nick," he commented, after a half-hour examination from a respectful distance by means of binocular apparatus. "You've seen the tests for yourself. The substance doesn't fit into anything in the

periodic table. It's an extremely heavy, unknown metal, highly electrical, and deadly to human life if you get too near it. Remember poor Stanley's fate! He must have fingered it."

Nick Easton rubbed a puzzled hand through his blond hair, eyed the ill-formed dirty-gray substance doubtfully.

"I can't figure out what happened to him," he muttered, frowning. "There was only a pool of water; the body had gone—flesh, bones, blood, and all the lot. What do you make of it?"

Wood pondered an interval, then looked at his colleague grimly.

"I'll tell you," he answered slowly. "The whole thing can be judged somewhat by its own weight. You see, before Stanley examined it, this substance, according to our recordings, was four pounds lighter and two square inches less than it is now. That apparently proves that it somehow absorbed all the electricity in poor Stanley's body and turned it to its own uses. Blasted him utterly out of being and left only water, the basic element of his constitution. Probably that would have gone, too, had we left the metal there long enough. Fortunately, we were called in before that occurred, and also before anybody else got involved. At least, we have that to be thankful for."

"Then—then you mean that the stuff is definitely electrical?"

"What else?" Wood relapsed into silence again, stroking his chin. "I can't just believe that this thing *is* a meteorite," he said at last. "Normally, a meteorite ought to be just—well, anything. Anything metallic, that is, but certainly not at all dangerous. This stuff, if you get too near, is like grabbing a live wire—in fact, worse, because it produces instant vaporization. That points to something in an energy form that we never heard of before. Hm-m-in—a *new* energy, eh?" He turned aside, struck with a sudden

thought, and pulled down an immense filing register from the shelf behind him.

WITH a frown in his face, he went through the sheets and finally fixed an acid-stained finger on one particular entry.

"May, 1935!" Gordon Wood exclaimed suddenly, and Nick peered over his shoulder. "That was just over three years ago. Professor Sampson Draycott and Dr. Charles Andrews, both of them physicists, filed papers here relating to a system of creating matter out of energy. At that time they wanted financial backing, but the board refused to allow it on the grounds that the theory was too vague and impractical. Now I just wonder——"

"Wonder what?"

"Well, Draycott lived in California. This metal was found on approximately the very site where his home had once been. It seems to me too much of a coincidence. I am wondering if this metal had anything to do with the experiment—if he tried it privately and, by some incredible fluke, succeeded. If so——" Wood's eyes began to brighten. He snapped the register shut. "If so, Nick, we've something here that doesn't fit into anything Earthly! It may be capable of anything. Matter born of energy never happened except by natural processes, such as when the universe was born. Damn it! If only one could approach the stuff!" He looked at it longingly, in the grip of the steel-clawed machine.

He and Nick both fell silent, thinking, and as they did so the quiet of the laboratory was disturbed by a peculiar, unexpected sound. It was the very faintest hissing noise, like steam rising out of a kettle. Wood aroused himself as it continued and looked round in puzzlement. Then, finally, his eyes settled on the metal as the cause.

"Good heavens!" he exclaimed, wide-eyed, then started violently as the lump suddenly began to visibly expand, accruing substance to itself like some metallic protoplasm. Nor were the steel clamps that held it of any further use. It burst them and fell heavily to the floor, continuing to enlarge. Then, as suddenly as it had commenced, it stopped once more. The hissing note ceased.

"Got it!" Nick ejaculated, snapping his fingers. "I'll bet it's the battery in the clamer itself! The metal's taken the juice out of it. Try it. I'll wager I'm right."

Wood nodded, and they both sidled round the now quiescent metal at a distance. Wood picked up a voltmeter and quickly placed its contacts across the battery terminals of the machine. Not the slightest kick was registered.

"Flat as a pancake!" he cried amazedly. "You were right, Nick. The darn thing eats electricity all right and grows thereby. We'll have to move it to a safe place."

"Such as?"

"Down in the cellars under this building, where we keep the dry goods. It'll be safe enough there from electricity. Clear the building of people. I'll use the automatic crane. Get busy!"

Nick promptly departed.

It took Wood nearly an hour to again clamp that dangerous piece of metal, and when at last he did succeed it was transported down the slanting slide to the cellars and there left to lie in darkness until those above could figure out a new way of dealing with it.

Certainly it was safe enough in the cellar from all normal disturbances. Had it possessed the power of motivation it would probably have climbed through the grating that led to the busy main street outside. Since it did not, it lay in silence, radiating a peculiar bluish glow that caused concern to com-

to the faces of those scientists who looked at it from time to time from the top of the cellar slide.

BY NINE O'CLOCK that night the institute was quiet and silent. Old Meadows, the veteran caretaker, wandered with his electric torch through the immense reaches of the place, taking his usual course through the ghostly aisles lined with gleaming bottles and impedimenta.

For an hour he pursued his usual limping course from ground floor to tenth and down again, then, purely in the line of duty, descended into the cellar. Having received no warning of what lay there—indeed, Wood had never even thought the old man was so thorough in his nocturnal prowlings—he was not unnaturally puzzled by the strangely glowing substance down there in the gloom. Thoughts of thieves passed through his unimaginative mind.

Steadily, he limped down the long stone slope, torch clutched in a gnarled hand, and came presently within a foot of the metal. He began to laugh at his fears; then the laugh froze on his lips. Strange sensations were creeping over him. He took a hasty step backward.

A searing pain shot throughout his body, flamed every nerve with unbearable anguish, crushed his mentality into the numbing darkness of eternity. His body pitched to the floor as though struck with a trip hammer, and hardly had it done so before it began to deliquesce, vaporized, and completely vanished. The remaining pool of water went last, evaporated into nothing. The outflung torch, still lighted, suddenly expired, the power of its small battery consumed.

For a while after that nothing happened; the strange electrical protoplasm was sufficiently gorged. Its odd hissing rose on the silence and presently ceased. Then again it rose into activity. The acquisition of the electricity from

the watchman, together with the slight percentage from the torch battery, had given it just the power necessary to expand its size and extend its influence over a wider radius.

There were many in the main street outside who swore to the fact that at about ten fifteen, twisting streamers of writhing electricity leaped from the cellar gratings of the research institute, and finally fastened themselves in colossal festoons to the street-car overhead wires.

In one tremendous surge the astounding substance absorbed all the power from the wires, so swiftly, so devastatingly, that its substance could not keep pace with the stimulus provided. Consequently, it burst, and the entire research institute hurtled upward and outward from the force of a gigantic explosion.

THE SHOCK was felt all over New York. Windows smashed; streets were torn up, and, simultaneously, all street cars stopped dead. Frantic engineers in the power houses raced to and fro looking for a technical fault. But, to their infinite amazement, they found nothing was visibly wrong! The generators and dynamos were functioning as smoothly and flawlessly as they had always done.

Fire engines, hastily summoned, raced to the blazing site of the research institute and got to work. A vast crowd turned out to see the blaze, swarming round the isolated, immovable street cars in a pushing, excited mob.

Within the private laboratory of Gordon Wood's home the telephone jangled noisily. Impatiently, he looked up from a gleaming mass of metal, annoyed at the interruption. Putting the finishing touches to his own invention of a microtelescope, destined, he hoped, to outclass all known microscopes by something like 3,000 diameters, he had no desire to have his concentration dis-

turbed. Irritably, he snatched the phone to him.

"What is it?" he snapped impatiently, and, to his surprise, Nick Easton's voice came over the wire.

"That you, Gordon? Say, listen, something terrible's happened! The whole institute has gone up like a powder magazine! Surely you heard it?"

Wood started and forced himself to think. He had heard a remote explosion, now he came to think of it. But, being fifteen miles from the institute and absorbed in his work, he had thought little more of it.

"I'll come at once," he answered quickly. "Meet me there."

He cast one last regretful look at his instrument; he would have to postpone his first test of its powers, after all. Ten minutes later his car had brought him to the scene of the disaster and, finding Nick, he stood with him and watched the immense blaze, sorrowfully watched thousands of dollars' worth of equipment going up in smoke. Nor was that all. Other buildings nearby, smashed irreparably by the disaster, were blazing fiercely.

"What the devil could have caused it, I wonder?" Nick muttered, his face troubled in the glare. "Any ideas, Gordon?"

"Plenty," the scientist answered cryptically. "There were no combustibles or anything of that nature in the building—no chemicals that could catch fire. There was only that damned piece of metal in the cellar. Somehow it brought this about; nothing else could cause so terrific an explosion. If that is so—" He stopped and frowned heavily.

"Well?"

"There's plenty that might happen. That stuff was un-Earthly—it belonged to an age long past, when life first spawned in the universe. It has a life of its own, of a sort—or rather did have—maybe intelligent life beyond our scale of reasoning—either too high or too low

—but, also, in common with all other forms of protoplasmic life, even though it was metallic instead of cellular, it could not be destroyed completely.

"For instance, if one were to blow protoplasm to pieces there would be some fragment that would escape and that would rapidly grow up again. Here we are dealing with electricity of unimaginable power, utterly beyond our comprehension. The damned stuff has blown up, that we know, and probably released something equivalent to subatomic energy in normal matter. That means it's still probably alive in some fresh form; it is obviously indestructible by very reason of its nature. It lives on the basic element of the universe itself."

"You know about the overhead car wires, of course?"

"What about them?"

Nick turned in surprise. "Why, I thought you knew! They're out of action. I tried to get a car down here, but I had to walk it. Look around and see for yourself. One or two people tell me that the power failure, which seems to have spread to the elevated as well, almost coincided with the explosion."

"It did, eh?" Wood's face set; he swung around actively. "That gives us a lead, anyhow. We're heading for the power houses right now. Come along with me; I want first-hand information on what happened."

NICK followed him to the parked car. For fifteen minutes they moved slowly through milling throngs of people; then, at last, they were in the clear. Ten minutes of speeding brought them to the main power station. Wood, knowing the place from long experience, streaked up to an emergency exit and burst into the hot, noisy interior with Nick behind him. Without hesitation, he singled out Donovan, chief engineer.

"Oh, hello, Mr. Wood!" He was clearly surprised at the scientist's sudden appearance. "What's your trouble?"

"Never mind my trouble; what about yours? What's all this about the power stopping?"

"Rarest thing I've ever struck!" he declared flatly. "The darn machines are running as sweetly as they ever did, but there's no power going from them! That's what we can't figure out. Somewhere there's a fault. There's *got* to be one! We're trying right now to find it."

"You've no theories?"

"None. In forty years I never knew anything like this. Thank goodness, the lighting section wasn't affected! That seemed to escape."

Wood nodded slowly. "How long will your examination take?"

"About another hour maybe. Can't tell. Why?"

"I'll stick around until you're through. I want to see what happens."

"O. K." The engineer shrugged and turned back to his work of supervision.

Wood turned quietly to Nick. "If they can get going again perhaps we can see if that darned stuff is still in action," he muttered. "It's quite obvious now that it absorbed all this juice and then blew up. If it's still in existence in some other form, it——"

He stopped and looked up sharply. The lights in the lofty ceiling were flickering and wavering strangely, like candle flames caught in a draft. The engineers looked up, too, astounded. That the lights in the very power house itself should behave fractiously was a mortal sin, an unforgivable slight on their reputations.

"What in hell——" Donovan began, then his sentence evaporated into speechless dismay, as every bulb suddenly dimmed down to red-hot filament and

then slowly expired. The great place sank gently into darkness. And yet, oddly enough, the mighty generators in the adjoining power-room section were roaring as powerfully as ever.

"Quickly!" Wood snapped, springing into life. "Get a torch, Donovan. I want to see those other generators."

"Right!" The engineer blundered around in the dark, then presently snatched a torch from some accustomed spot. Its penetrating pencil abruptly stabbed the gloom. Rapidly, he led the way into the adjoining wilderness of thundering machinery.

Tight-lipped, Wood stared at the output meters, cast his eyes over the whole array of white-faced dials. When he turned he could dimly behold Donovan's astounded face.

"By hell!" Donovan swore thickly. "Every darned meter down to zero! No load is going through! Say, Wood, what is all this about?" He clutched the scientist's arm almost appealingly. "This is against all reason. These machines are functioning as perfectly as the others, but no power is being generated. *Why?*"

"Shut them off," Wood ordered curtly. "The juice is being absorbed. It will prevent further supplies if you stop generating. Hurry!"

SOMEWHAT BEWILDERED, Donovan obeyed, pulled out massive master switches, then stood waiting for the next. The generators droned to a standstill. In the torchlight Wood's face was set and determined.

"Listen," he said grimly. "You guys will be able to figure out what I'm going to tell you much quicker than ordinary people. There's something loose that feeds on electricity. We had it in the research institute before it blew up. There's the fear now that it may do something more than just consume juice. Being electrical energy of some kind,

of a type never known on Earth before, it is likely that it will upset our own electrical systems completely. Did you ever hear of living electricity?"

"Like a live rail?" Donovan hazarded heavily.

"Lord, no! I mean alive—like us! Able, probably, to think?"

"Say, Mr. Wood, what are you getting at?" Donovan demanded bluntly. "Are you trying to tell us that you scientific guys over at the institute have made something out of electricity that thinks?"

"We had nothing to do with it, but a professor out in California had. He tried to make matter out of energy, and there is much to prove that he probably succeeded. That stuff in our cellars was the result of his experiment, and if, as we believe, it was primordial electric protoplasm, it represents life as it *should* be in the universe, instead of our own absurdly limited little forms. Flesh and blood isn't the only thing that can think, you know. And remember this! All of us are electricity when it comes to rock bottom.

"Chance made it that certain cosmic wave lengths produced life and intelligence in carbohydrates and phosphates, which caused us to evolve from mere slime to our present status. An infinitely shorter wave length, the one which brought our universe into being, could produce the same effect in metal, but once more electricity would be the basis, just as it is with us. So you see, I fear that this stuff, even though blown asunder, has released its strange energy in the form of radiation, and is, in consequence, reforming and repatterning all things of an electrical nature on the Earth. The more electricity it gets, the stronger it becomes."

"But it isn't possible to make matter out of energy!" Donovan snorted.

"I agree with you that it has never been done before—but this time we are

quite confident that Professor Draycott *did* accomplish it! Hence the danger!"

The engineer scratched his bald head. "I reckon I can't make sense out of it, Mr. Wood. What's worrying me is how we get this darned electricity back into shape. You say there's something electrical upsetting us? Well, why don't we find it and—and exterminate it?"

"About as simple as rubbing out a shadow with an eraser," said Nick. "We can't get at it. It's radiation. Isn't it, Gordon?"

"Of a sort." He nodded worriedly. "Frankly, we don't know what the devil it is. Like electricity, we don't know its real nature, but we do know its effects. Later we may be able to form some idea about it. In the meantime, I shall do all in my power to sort the thing out—rest assured on that. Keep the generators off until you get further orders. This isn't just an ordinary breakdown; it's a case where everybody will have to take their orders from the scientists. We'll have to establish fresh headquarters, to start with. Temporarily, we can use my home."

"I get it." Donovan nodded, though he was obviously still puzzled. He looked down at the torch in his hand. "Funny that a whole power house fails and yet this little thing keeps burning, isn't it?"

"No, it's quite natural," Wood answered quietly. "This unknown quantity, as we'll call it, is absorbing the vaster quantities first. Things like that torch battery will go later. But now I've got to get going. There's plenty to do. Come on, Nick."

Donovan lighted the way back to the emergency exit; then the two scientists passed into the darkened metropolis. Everywhere was incredibly gloomy; there was only the starshine for illumination. Where formerly the city had been ablaze with the lights of the late evening, there was now not a single glimmer.

## III.

NEW YORK accepted the city-wide black-out with the calm philosophy of good citizens. There was no panic, but there was a good deal of pickpocketing as audiences left movie houses and theaters to the illumination of guttering candles.

In many ways it was considered a unique experience to come out into a city utterly dark. Those who still possessed gas lights in their homes and shops smiled in a superior way and commented sagely on these newfangled electric gadgets that were always getting out of order. In other quarters radio-station engineers were frantic with dismay, and so were ardent listeners whose particular programs had suddenly stopped dead.

The major emotion of philosophy and good-humored banter changed later to a definite irritation, when it was found that there were no street cars, and no subway or elevated trains. People stampeded the various stations, lost themselves in cavernous darknesses, and in the subway in particular there would have been tragedy had not the police come on the scene with small, portable searchlights.

Little by little, it was forced upon everybody's knowledge that the electricity failure was a very real thing; but even then they were not permitted to know that the engineers behind it were as baffled as they were. They walked home with mixed feelings; others' feelings were far more than just mixed when they realized how many floors they had to go up without an elevator.

Beyond question, the most worried man in the city was Wood himself and, in a lesser degree, Nick Easton. Practically all through that amazing night they were kept busy answering telephone calls from other employees of the institute, and particularly from Dr. Simon,

managing director of the concern. Like most managing directors, he wanted to know the why and wherefore and only just stopped being abusive when Wood reiterated wearily that he couldn't explain the matter.

"We'll have to think up some excuse," Nick said. "Old Simon and his fellow directors won't believe that the explosion just happened. As chief scientist, Gordon, you might be in a spot."

"Spot, hell!" the irritated scientist retorted. "That's trivial, anyhow. The whole works has gone up—yes. So what? That isn't what concerns us. It's this devilish electricity that confounds me. How do we even begin to get at it?"

"Since all electricity is cut off, doesn't it stand to reason that there will be no increase in the strange power of this unknown quantity?" Nick asked presently, his face thoughtful in the candle-light.

"No—that's the pity! A power such as has been unleashed can take so many diversified forms when we realize that everything is really electrical. Since it can convert the power of an entire power station to itself, assimilate it into its own radiative form, it stands to reason that, as it attains a fresh balance or state of progress in its evolution, it will include almost everything material, because everything material is electric." Wood paused and looked at his friend grimly. "Nick, it means that we are facing destruction!" he said slowly. "Our life will be usurped by the form of life that should have dominated the universe had not chance brought us into being instead. Thinking energy! Intelligent electricity! Good heavens! Who'd ever have thought of it?"

"And impossible to reach!" Nick muttered.

"We can only watch. We may think of something, but from the very nature of the thing we're fighting I very much doubt it!"

WHILST WOOD tried to see some solution to the problem, whilst the people of New York slept in darkened rooms, whilst the remains of the research institute died down to glowing embers, slow and incredible changes were taking place in the very structure of the city—changes in the basic forms of earth and atmosphere that had never happened since time began.

When Dr. Andrews had believed that the creation of matter out of energy might produce far-reaching and perhaps devastating effects, he had only touched the very fringe of imagination. He could never have foreseen that vast shuffling of atoms, that bending of electronic orbits, the slow expansion of molecules, and the inovement of unknown radiations.

The electrical energy of the exploded matter had, at the explosion, released itself in the form of radiation, but of a type totally different from any known on Earth or in the universe since matter had begun. Draycott had provided the key to a locked door, given birth to a form of matter which Nature, in her wiseness, had chosen to leave in abeyance.

What had been the purpose in giving motivation and thought to lifeless carbohydrates in the beginning no man knew—but now that was at discount, was no longer a stable and accepted thing, but a random element in the midst of a new and inexplicable change. For, in its steady expansion, in its rapid evolution from lowly electric energy to a form of radiation defying comprehension, the unknown quantity had begun to reassemble all the electricity about it in just the same fashion as the first living men had taken to their caves to hide from the rigors of the Glacial Epoch.

It was a metamorphosis unseen, evident only at first in the failure of all electricity. Man could not be expected to see the reshuffling going on under his

very nose; could not possibly note the gradually expanding area of the unknown element. He only became aware of an invisible interloper in his midst on the following morning, when the city awoke to the day's work. It was forced on his attention by little but frequently recurring instances, at first almost unnoticed, then demanding observation by reason of constant repetition.

Here and there buildings were different. The stonework had changed to a most peculiar yellow shade instead of the normal gray—or, in the case of the whiter, newer edifices, there was a distinct streak of green in their midst—a strange and oddly shimmering green that swirled and eddied with indefinable beauty, and yet which seemed to be deep within the stone instead of merely on the surface. Curious people touched the stone, to find it as hard as ever. It was, as one bright reporter put in his newspaper—printed by hand presses owing to the failure of electric supply—like “soaking a mist on the jaw and finding the jaw, amazingly enough, to be very hard!”

IN PARTICULAR, it seemed, was the Ranbury Building affected, owned by the famous Silas Ranbury, financial magnate. Perhaps because it was the nearest large edifice to the institute disaster of the night before, it was one of the first to be really disturbed. Certainly remarkable things happened to it.

Ranbury himself arrived at eleven in the morning, muttering uncomplimentary things about broken-down elevators; then, from force of habit, jabbed the bell push on his desk. Since it was connected to the electric mains it failed to work. Dark with gathering rage, he strode ponderously into the adjoining office and yelled for his secretary.

Miss Chester, angular, and usually very collected, swung a pair of bovine eyes upon him and remained exactly where she was—at her desk. Her ex-

pression was easily the strangest Ranbury had ever seen on any woman's face.

"Perhaps I can get some attention here," he said sourly, from the doorway. "What in hell is the matter with everybody?" He strode in impatiently, then stopped in sheer amazement. His eyes popped as he surveyed the empty space where tables and desks and staff should have been. His eyes shuttled up and down the emptiness.

"Miss Chester, who gave the staff permission to move out of here and take the furniture with them?" he asked. "Answer me, can't you?"

Still Miss Chester did not move. She seemed to be trying to speak, and at last she managed it, in a series of gasping jerks.

"Sir—there is something terrible going on in here! The—the others just melted into thin air! And the desks and chairs!"

"What!" The financier's brows came down fiercely. "Now, listen to me, Miss Chester. I want an explanation of this removal of furniture. I've had quite enough for one day! Where the devil is everybody? Hurry up and tell me—there's work to be done! Come now or—"

"I can't, sir!" Miss Chester nearly screamed. "I don't know what's happened. I'm—I'm ill, I think."

"Ill, eh? Stuffy atmosphere in here, I suppose." Ranbury scowled and turned to the window. With a flourish he flung it open, then turned back to the now wailing woman. A violent start shook his ponderous body.

She was there, yes, but what in Heaven's name was happening to her? She was—yes, *smeared!* That was it! As though her clothes and body had all run together in the most astounding, nauseous fashion. Then the chair and desk began to behave in the same way

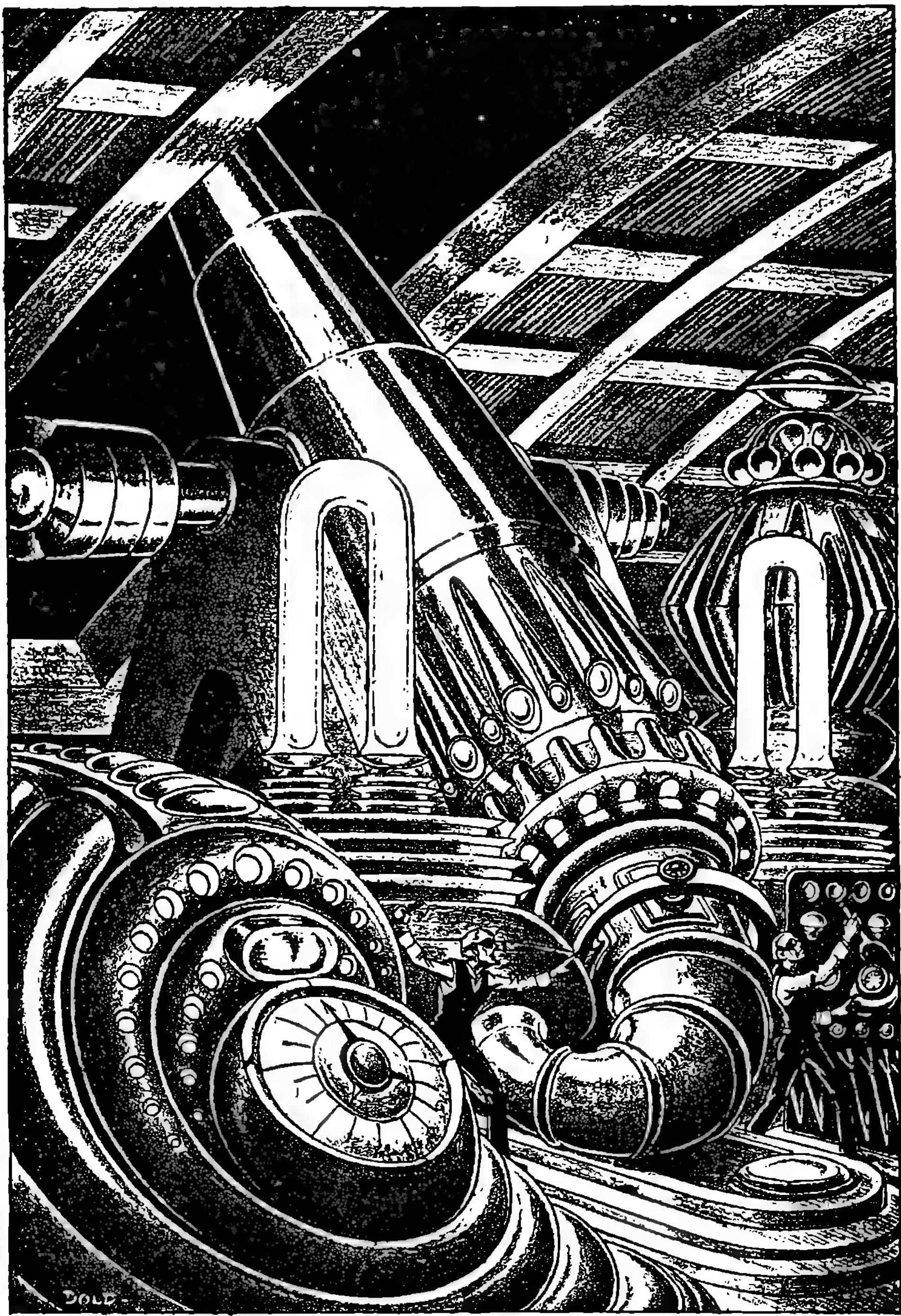
—danced and shimmered like creations of wax before a blazing fire instead of being solid metal.

Even as Ranbury stood there, transfixed, the whole combination, woman included, congealed into a shapeless, gleaming mass. Then it gradually vaporized and left nothing but thin air. For a moment Ranbury was conscious of a tingling pain shooting through his body—and that was all. His last scrap of office furniture, and secretary, had gone!

"What—what in thunder—" he began blankly. Then his eyes turned to the walls. They were smearing now, mysteriously, inevitably. He could see little saffron streaks creeping through their grayness, spreading out like arteries. Again came that decided tingling sensation.

He staggered forward a few steps, intent on leaving the office—but he never succeeded in doing it. At lightning speed the wall suddenly smudged and melted exactly as the furniture and secretary had done—soundlessly, and with devastating efficiency. In consequence, not only the entire thirty-seven-story Ranbury Building disappeared into the air, but the whole block on which it stood as well! The well-known spot was left completely empty, and in its stead stood a vast crater penetrating deep into the bowels of the Earth.

Police and reporters swept to the scene at top speed; people gazed down into the abyss, doubting the evidence of their own senses. Reporters cursed the uselessness of telephones and raced back to their newspaper offices. Hardly had they done so than runners arrived with the news of the disappearance of other buildings in the near vicinity, and of all the people inside them. Always it seemed to be the more modern ones that suffered, perhaps because of the greater complement of metal. But that the change was also spreading to the



*The electromagnetic attractors glowed white-hot. Andrews looked up tensely—turned and nodded—*

older ones was no longer in doubt, if their shimmering play of colors was any guide.

GORDON WOOD, in the meantime, in close touch with events, was playing host to the dubious directors of the late research institute. Literally, having no place to go, they had come to the scientist's residence, at his request, to review the situation.

"Gentlemen, it is worse than I thought," Wood said grimly. "The whole face of the city is being patterned afresh. Three buildings gone in one day, together with the loss of countless lives. Electricity still refuses to work. Business is paralyzed because of it."

"How do you reason out the disappearances, Wood?" Simon, the managing director, asked heavily. He was not a scientific man, hardly even imaginative. Blond, sixty-two, and round-faced, he was concerned with the finances of science, not its ideals.

"They're not very difficult to explain. The exploded matter changed into radiation, or energy, just the same as ordinary matter would have done. In this case an unknown form of energy was released. It is conforming the foundations of material life to suit itself, attacking first the metallic substances. When the assimilation is complete and the new electronic formations formed, matter as we know it ceases to be, and there is emptiness. But I don't believe it is really emptiness—only invisible radiation."

Wood paused, leaned impressively forward across the table.

"Little by little, unless we can find a way around the situation, this energy will assimilate everything to its own level, destroy what centuries of evolution have built up. It will change not only the ordered pattern of the Earth, but that of other worlds and, maybe, the whole universe. And why? Because it is a matter-energy state that has not

been active before. Now it is evolving, and ultimately it may become possessed of thought. When that happens all material life will have vanished, and the true life that was intended for our universe will have come into being."

"And what do you suggest as a possible remedy?" Simon demanded.

Wood shook his head slowly. "There isn't one!"

"Come, come, Wood, that's absurd! You don't suggest that we are to be dictated to by an unknown element? Science can conquer anything."

"It can conquer most things, I know, but not such a thing as this. No man knows how to begin. How is one to begin to attack an unseen radiation, an evolving form of energy that can change the very electrons of life into a new pattern of its own, that can wipe out the most material creation as though it never existed? No, gentlemen, the more the thing is studied the more complex it becomes. I will try and get into touch with other scientists in the unaffected parts of the world and see if they have any suggestions. The only way to do it, since radio and submarine cable are paralyzed from this end, is to send fast airplane messengers. That I have already taken the liberty of doing, warning other countries as well. When I have their conclusions I might be able to do something. Until then—"

"We sit and wait!" the managing director said. "A damned nice state of affairs!"

THAT SAME EVENING a thunderstorm of tremendous intensity burst over New York. None of the flurried, baffled populace had much idea where it had come from; they were too harassed by the events of the day.

It was, nevertheless, a storm of such bewildering force that it made itself noticed by the most nerveless temperament. It started just before midnight and continued in crashing, blazing furies of ele-

mental madness until nearly dawn. New York was ablaze with bolts of lightning, shaken to its foundations by the frightful detonations of thunder. Then, toward sunrise, it began to abate; a weak daylight filtered upon an incredibly changed city.

Many of the taller buildings had been blasted down by lightning; others had completely disappeared in the same mysterious fashion as the day before; but most amazing of all was the presence, in unexpected places, of towering masses of smooth-faced metal, gleaming dull gray in the morning light.

To their summits, these masses stood eight hundred feet or more, their various facets cut so smoothly that they instantly revealed their strange nature. No man could possibly have had a hand in them—not even Nature, for as a rule Nature is haphazard and careless with her efforts; she never cuts out a creation with razorlike sheerness.

Wood, Easton, and the other scientists, together with the directors, were not the only people who stared upon those astounding creations that morning, but they were at the forefront of the multitude that swarmed from every quarter of the city to try to discover what it was all about.

Buildings, it was found, were still swirling with that strange repatterning light. Some of them vanished even as they were watched. Here and there isolated human beings disappeared, too. But devastating though these occurrences were, they paled into insignificance beside the new happening.

Returning home, having made arrangements for the populace to keep clear of the substance, Wood endeavored to explain it to his puzzled associates.

"We may assume, I think, that the repatterning is taking definite form," he commented. "Obviously the buildings and people that have been vaporized, the electric energies that have been absorbed, have had to form into a fresh

state. Last night that state must have been reached, and this strange form of energy rebuilt itself into material substance identical with that which Draycott originally made. In consequence, we have these faceted pieces of matter, so beautifully cut that they express, somehow, an intelligent motivation behind it all. The more I see of this confounded stuff the more I get that it really does think!"

The others said nothing; it was obvious that they doubted the fact.

"I can't see why the darned stuff suddenly decided to turn itself into matter," Nick remarked. "Why the devil didn't it do that at first, instead of existing as free energy?"

"You might as well ask why primeval protoplasm didn't turn into a thinking animal right away. It had to evolve to that state, and when, finally, it attained that stage the effect was complete and resolved. So it is here. All this time, whilst things have been disappearing, whilst electricities have been absorbed, this radiation has been progressing, and last night that thunderstorm obviously represented a change in its state when it achieved solidity. The result is those lumps of matter. The process is still going on. Larger and larger matter formations will occur, and ultimately we shall find ourselves overpowered by this new form of matter life. If I could get hold of some of it, I might be able to analyze it and devise a means of destroying it."

"All right, then, let's get some of the metal!" the managing director snapped. "What the devil are we wasting time for?"

Wood said nothing to that. He realized more clearly than anybody the extreme caution necessary in attacking the strange substance. Besides, the drills he proposed using might themselves be converted into energy; the only thing against the possibility was that the lumps of metal might be in a com-

paratively quiescent state for the time being. So he decided to take a chance and made arrangements for steam-driven drillers and clampers to get to work. Then, toward late afternoon, the public cleared away by police, he, in company with the others, watched operations anxiously.

At the end of two hours, powerful though the drills were, they only succeeded in hacking off a piece three feet square. Immediately, there was a rush toward it.

"Wait!" Wood yelled hoarsely. "Stand back! Don't touch that metal if you value your lives! Heh, Casey!" He swung round to the clamer driver. "Use your clamps on this stuff and drop it into that insulated steam wagon. I'll take care of the rest."

"O. K., Mr. Wood."

THE ORDER was obeyed and the precious piece of metal duly deposited in the waiting wagon. Wood and the others vaulted up beside the driver, and the heavy vehicle began to return to the center of the city, finally arriving at Wood's private laboratory at the back of his home. The wagon was backed round, the metal tipped out onto the concrete floor via the window. Once that was done, Wood felt safe to act, but he took good care to keep his distance from the fragment as he began to move an instrument into position.

"What's the idea?" asked the managing director curiously.

"A microscopic examination," Wood replied quietly. "This instrument here is my own invention—a telemicroscope—and so far it hasn't had a test. I've spent years making it; it works on the principle of trapping and sifting light rays from the object to be examined, but the magnification is roughly three thousand times greater than the best microscope in existence. Besides, its principle makes it possible to view an object at a distance, which is exactly

what we need in this instance. Here goes!"

He jammed his eye to the powerful series of lenses and swung the instrument round until it was fully trained on the brightly sunlighted piece of metal on the floor. Time and time again he made minute adjustments, fitting lens after lens, finding the piece of metal becoming larger and larger under the increased power.

Then, at last, his breath caught sharply. He pushed his eyes even closer to the shaded eyepiece and stared unbelieving.

"Good—heavens!" he jerked out at last, and looked up astounded. "Nick! Tell me if you see what I see!"

Easton jumped to look, then swallowed hard in his throat. Under the extreme power of the lenses the metal was no longer metal but a mass of interstitial substances, a metallic honeycomb surging with life completely invisible to the naked eye. Spots of light, tiny points of incandescent brilliance, were moving with incredible speed, never once colliding, but conveying the impression of colossal hurry. It was like a strange, dark sea of living beings, a tiny universe of swirling worlds.

"Planets—or people!" Nick ejaculated at last.

"What!" Dr. Simon exostulated, and leaped forward. "Let me look!"

The scientists stood aside and allowed him to do so. When he looked again, his round face was utterly amazed. "What is it?" he gasped blankly.

"Life!" said Wood very slowly, frowning. "Life! A life such as we never expected to see on Earth. The *first* life, the *real* life, life within matter! No longer just an inert state, no longer matter that is ductile and malleable in our hands, but living, electrical life—the very core of the universe itself."

"I don't understand. Make it clearer, man!"

"It's simple enough. You see, until all this happened every form of inert matter such as—at random—stones, iron or gold—were purely inactive substances with no motivated, intelligent life of their own. Composed entirely of atomic formations complete with electrons and protons, the number of electrons varying, of course, according to the element concerned. They were the products of a half-finished experiment by Nature. Somewhere in the dim past wave lengths came together and coincided, and the outcome was inert matter. Before that wonderful happening could be pursued to its conclusion the state ceased and left a universe filled with blazing forms of matter and a vast amount of empty space.

"The pattern of infinity was incomplete. Later, we may assume, another chance combination of radiations came together and excited the inactive carbohydrates of certain cooling worlds, our Earth amongst them, into chemical activity. Protoplasm came and, cycles later, intelligent man. But through all this wonderful process the inanimate form remained inanimate—unintelligent—waiting for that one chance to happen which would enable it to find itself.

"Draycott, all unwittingly perhaps, brought that one chance into being again. He found the chance combination of radiations, and inanimate matter began to live again. First, two energies combined to form the first matter; that exploded into intra-atomic energy and released itself; it then 'digested' everything electrical and patterned itself as surely as the primeval amoeba patterned our present world. Finally, evidently reaching a peak in its evolution, it changed its state into one compatible with its surroundings, and visible matter arrived on our world. But it is different from ordinary matter in that life teems inside it, active life that is perhaps intelligent, and which, because it

has all the basic powers of infinity to work on, will easily overthrow us.

"We exist on a border line. A happy chance put us there. But here we have a life that nothing can affect; life as it should be, unaffected by heat or cold, air or vacuum, distance or pressure, or even death. Electrical energy can never die so far as we know. So, we gaze on the first life, pursuing beyond doubt the purpose Nature really intended before she slipped up on the job and produced us instead."

"Then—then the Earth will be changed?" Simon faltered.

"Every form of matter as we know it will be changed," Wood answered grimly. "It will all break down into an energy state and be reformed into living matter. Ultimately we shall have a universe as it was intended to be, and not a haphazard, incomputable emptiness dotted with pointless spots of matter."

"But, say, why is it progressive?" Nick asked in puzzlement. "Why is it that the initial expansion and formation is still going on?"

"Why not? Since all the universe is electrical in nature, the new life has an inexhaustible supply. It uses electricity in all its forms to further its own ends, be they cosmic rays, heat rays, X rays, sunlight, unknown waves in the ether— It utilizes them all and naturally changes them to supply a favorable balance to itself."

"And to destroy it?" the managing director asked tentatively. "Have you found a way now you've examined the stuff?"

Wood shrugged futilely. "No. It can't be destroyed. One might try to destroy ordinary life itself just as easily. It couldn't be done. We shall have to advise the people of the entire world exactly what has happened. We are forced to prepare for the end. Elec-

tricity is the only weapon we could use and that is, obviously, useless. Firstly, because we haven't any to use, and secondly, because, even if we had, this damned substance would eat it all up. No. It means a slow and inevitable changing of the whole nature of things, the rapid progression of the first life to its ultimate destiny!"

#### IV.

BE IT SAID to Wood's credit that he did make every effort to warn the people of the world what was taking place. In New York, of course, center of the trouble, he was readily believed and thereby precipitated the most amazing happenings.

According to temperament, there sprang up riots, prayer meetings, Judgment Day seekers, tub thumpers, and soap-box orators. Crime swept the metropolis in a devastating wave. Knowing that life was doomed to extinction, certain of the population gave way to all their secret lusts and villainies; in consequence, murder and rape reared their ugly heads in the shadows.

In other parts of the world there was flurry, bustle and anxiety. America was a suddenly dead continent, untouched by wireless or telephone, manifestly in the grip of a great unknown. Boards of trade huddled together and tried to imagine what had happened to international relationship. Money markets shattered; the whole structure of civilization began immediately to totter at the foundations. Frantic people pelted steamship offices with inquiries; the telephone company was inundated with a flood of demands as to what had happened to the Atlantic submarine cable. In every country big business men chewed on their cigars and worriedly watched their tottering fortunes. Never before had there been such incredible catastrophe.

In the meantime, totally unaffected by the fears and concerns of petty humans, lords of the border line of creation, the strange metamorphosis of elemental power went on. By degrees New York began to evaporate, and, also, by degrees, in exact proportion, new metallic matter formations appeared. The whole face of the city changed within a week of the initial explosion at the research institute.

From the approximate center of New York the disturbance spread with lightning rapidity to Long Island, Brooklyn and New Jersey. The old, familiar sky lines vanished completely, and instead became irregular hills of metal. Overnight, almost, Brooklyn was joined to Manhattan Island by a solid mass of metal, metal so highly energized, so teeming with electrical life, that to go within two miles of it meant certain transmutation into the new element.

Hence, disaster certain throughout America, there began a tremendous exodus to other countries. But, at best, it was only staving off the evil hour. Through the days and weeks the influence spread inevitably.

Wood and Nick Easton left America with the other fugitives and made straight for London. They found the usually complacent English in a state of intense panic. They realized now that disaster was indeed coming, and something of the horror that had engulfed America began to sweep over the British Isles. It was the utter hopelessness of the situation that caused such trouble. There was nowhere on Earth to which anybody could go and be safe. Ultimately, destruction would catch up.

And the farther the trouble spread the faster it seemed to act. Within the space of six weeks all America and Canada had succumbed, were covered with irregular plains of dully gleaming metal that extended way out into the

Pacific on one side and the Atlantic on the other. The change was coming very close indeed to English shores. The influence was already upon those green islands, instanced by the abrupt failure of all electric apparatus and the vanishment of buildings.

Overnight the unknown quantity stepped into the midst of the country, but, unlike its haphazard efforts in New York, when it had striven to attain a balance, it moved now in an advancing tide, evaporating everything in almost a straight line, reforming into matter after a short interval, then going on again.

Throughout the terrible night when the unknown quantity really entered England, panic-stricken people moved in yelling multitudes through every quarter of the country. Some flew to the isolation of the open; others raced for the company of other people, but all of them were inevitably trapped.

Wood was with Nick when the disaster reached him. With the calm philosophy of true scientists, they knew only too clearly the futility of trying to escape from the enemy. So they waited for it to come to them, seated on a form on the Thames embankment, overlooking the major bulk of the city in the calm light of early dawn.

It was hard to believe that there was anything wrong when they looked northward. Southward, however, there was no London—only a vast and hazy expanse of metallic desert that crawled visibly forward. The city's prosperity had ended. No vehicles were moving. Only the sound of shouting, terrified people was in the air.

"Well, I guess it's finally caught up with us, Nick," Wood commented with a twisted smile. "The human life has had a good run; now it's the turn of the proper life. It won't be long now!"

Nick nodded slowly; it was unaccountably hard to face death com-

placently. Wood was the elder man, far more incisive and philosophical than his partner.

"It doesn't seem right—" Nick began almost hotly, then paused as a prickling sensation passed through his body. It was as though countless thousands of needles were driving into him. He winced with pain, jumped up, staggered forward a step. He caught a glimpse of Wood's strained, set face, gleaming with sudden perspiration. He said no words—simply pitched forward from the form very abruptly and lay still on the flagstones.

"Gordon!" Nick shouted desperately. "Gordon, old man—"

He lurched dizzily. Confound this pain! He moved forward a step to pick his friend up, but by the time he had forced himself that far, Gordon Wood was no longer there; he had evaporated utterly into nothing, changed and resolved into the unknown tide.

Nick shouted again, huskily. Behind him a metallic incredibility was fast forming. The violent, prickling pains increased. A conviction of inexorable pressure drove into every nerve, until, head reeling in swimming blackness, he, too, went crashing to the stones.

Within ten seconds his body had vaporized.

WITH inexorable progression, the strange metamorphosis went on. It wiped out England utterly in the space of nine hours, and still went on implacably, resolving every human being, every scrap of landscape, every drop of water, every molecule of air, into one continuous condition of unbroken matter. Until at length the Earth resembled a rough-hewn ball of unjointed matter teeming with incredible new life.

From that point the insatiable substance still went on, following out the plan it should have followed in the beginning. It reached vast metallic arms

into the deeps of space. Under the increasing weight the Earth collapsed completely and changed from a ball into a vast sea of matter floating in space, reaching out branching arms like some primeval amœba, digesting and assimilating the constant flood of radiations sweeping the unplumbed depths of the void.

At length it covered the 93,000,000-mile stretch to the Sun, and wiped out that luminary completely, expanding enormously by the increase of electric energy to its strange formation. By inevitable degrees the now-frozen worlds of Mercury, Venus and Mars were obliterated. The inner circle of the solar system was no longer empty space, but an incredible mass of matter in which space had been utterly swallowed up.

And, as it had been on Earth, its progress increased in proportion to its steady enlargement. It ate up the abysses and filled them with solidity. It engulfed the outer planets and extended its ramifications to the nearest stars. Onward and onward, forever breaking down and converting itself, through years—centuries—uncountable millenia.

The spatial universe began to disappear. Electromagnetic ether, so long the vague unknown to scientists, was instead patterned with new life. From the center to the extreme limits of the universe there came to be no space, only one vast dull-gray immensity in which life spawned in its most natural and yet most incredible form.

When—and only when—this stage had been reached, was the metamorphosis complete. Every scrap of available energy had been utilized and changed to suit the new energy's requirements. The required level had been gained and, just as man had found life when the equilibrium of the former universe had been reached, so the new form of life, that had existed as dimly intelligent electric power in the beginning,

began now to take shape, to pattern itself into recognizable formation.

## V.

THE mind that had belonged to Gordon Wood of Earth, which had been suspended in faculty for an unknown time, began to stir slowly in a deep, unknown sea of impulses and suggestions. Out of the blackness there came the dawning light of new knowledge, and with it an intense remembrance of incredible events, of energy transforming into unknown matter.

As he arose out of this gulf he became aware of two things: one, that his body was a form of glowing, bluish energy; and, secondly, that he existed in an apparent endless sea of misty light, incredibly beautiful light possessing the misty translucence of a pearl. It came to him as a momentary shock when he realized that everything he saw was not accomplished by eyes, but by the pulsing of various forms of electric radiation. He had no nerves, no sexual power, no emotions, was nothing but a somewhat heavier form of the endless sea of pearly light surrounding him.

Spread in the distance before him, as he became more and more aware of his environment, vanishing into inconceivable distance, were other beings, gently moving spots of light pursuing, no doubt, their own purposes. His mind went back to that unknown time when he had examined the fragment of metal in his laboratory. It had been populated by beings such as this, and now he was a part of them!

He was puzzled, faintly bewildered, but not afraid. He knew he had died and risen again, that his Earthly body had long since been resolved into a new type of energy, that his mentality had lived on, and, at last, taken on its individual power again after unknown in-

ervals of suspension. He began to wonder whence came the electrical stimulus that fed him so constantly. That was beyond his understanding.

He thought of Nick Easton, wondered what had happened to him. Hardly had the thought formed in his mentality before he found himself abruptly propelled through the iridescence to come to rest not two feet from another glowing form identical to himself.

He tried to speak, remembered that he had no vocal cords, and instead thought of the words he intended to convey.

"Can you—can you be Nick Easton? That was?"

Immediately the answer came back, perfectly legible, the pure, sharp-cut essence of thought itself.

"I was Easton, yes. You're Gordon, of course? What do you imagine has happened to us this time? Look at all this—these countless millions of light spots. Undoubtedly they are intelligent. Do they possibly represent the vanished people of Earth?"

"I think I just begin to understand," Wood replied. "That matter life we saw forming, when apparent death overtook us, must finally have attained its level, and the new life came properly into being. Those electric creatures we saw in existence so long ago in that chunk of metal really represented just haphazard beings, without much intellect. Remember how they raced about so desperately, as though trying to figure things out? It was pure confusion! This is ordered, perfect symmetry."

"When an element reaches a perfect, equipoised state every one of its attributes and formations is in perfect tune with each other. The outcome is a flawless unity. Our old universe was never that way. It was a third inanimate matter, a third half-intelligent carbohydrate, and a third space. That explains, too, how it is that the instant I

thought of you I found you. Perfect organization impelled me, literally, with the speed of thought, right to your side."

"And our exchange of communications without words?"

"What else but pure thought transference? Thought is electrical; therefore, it is the easiest medium of exchange. Remember how we tried it in the old days, and how we were hampered? There is much now that is being made clear."

"There must be others," Nick commented. "Suppose we try and find them?"

"Agreed," Gordon assented, and together they swept the endless abyss of pearly light. It was as they pursued their astounding journey that they began to more fully apprehend what had occurred.

There were not only Earthly minds in this vast expanse of electrical knowledge, but those of other worlds, of Mars and Venus and the giant outer planets, which formerly had existed in the various formations common to those worlds, but were now reduced to a common level. Then there were also the beings of the planets beyond the former ken of Earthlings, far away in the infinite depths of space.

It came to Wood, as he pursued his journey and exchanged communications with these varied denizens of long-forgotten worlds, how utterly different the new state of affairs was. Gone was the old muddling order; gone were the old struggles, the racial differences, the different levels of intellect, the uphill battles to try and understand.

Space was no longer a barrier; space and matter were now interwoven in the pattern nature had intended until chance had changed it. The universe was a spatial one no longer; only a form of matter which, to the electrical beings

populating it, had all the appearance of pearly vapor. To them had been granted the power of passing through the very interstices of matter itself. Heat and cold, death and illness, were no longer their lot to bear; instead, they could exchange information with the more advanced ones, and gradually bring this new and amazing life into one of perfect concord.

SINCE there was no cognizance of time, now that visible matter was not in existence to them, neither Wood nor Nick Easton had the slightest idea how long it took them to gather together the major minds of this strange infinity. Perhaps it took them æons; they did not know. But ultimately they had established a common union of thought wherein they began to realize the vast purpose that, before, had been left unfinished.

The accepted leader of the new universe, leader because of his clarity of thought, finally made clear the new existence in a thought transference to his multimillions of contemporaries.

"When the universe existed in its old state there was, of necessity a completely disorganized state of affairs that none of us could rightly understand. We did know, however, that electrons were the basic formation of matter. Therefore we knew that electricity was also the basic formation. What we could not correlate was the infinitely big with the infinitely small. There seemed to be no reason for vast emptiness in which matter flamed away to eternal death—and indeed there was none. It was an unfinished masterpiece. Various haphazard things took on the intelligence which we now have as a massed whole. We each lived and thought in our own particular little sphere, and tried to imagine what lay in the empty spaces beyond our particular galaxy.

"Now we know the truth. Thanks

to a scientist of Earth, the mistake of the beginning has been rectified and the law of chance again operated. The universe now is filled from end to end with matter, and we are part of that matter, beings of electricity—we call it such for want of a better name—who, instead of reacting on the thoughts formerly given to us by the electrons comprising our beings, now operate purely as thought.

"Such things as electrons do not exist here; we know them now for what they were: purely the smallest expressions of thought, fragments left over from that great, unfinished attempt. We have proven that mind lives on eternally; but we could never understand why death broke the continuity. Now we know that it never did; that we would have continued to live in a series of fragmentary states, had not a chance happening resolved for us the real nature of the universe.

"We move now by the pure impulse of thought. There is no such thing as planets, no visible matter at all, no profound riddles, no barrier to distance. We are self-contained and need never puzzle again because, about us, ready to be summoned on the instant by pure thought alone, are the greatest minds of our former universe. The mysteries of creation, of energy, of matter, of inexplicable space time are all explained; we know now that they were merely erroneous concepts brought into being by our formerly unsuitable bodies and brains. That is why planets never could communicate with each other, why we found space a bar to our material progress, and that is why electricity was always, and is now, the basic power of thought and eternity."

"And the mind that gives us our minds?" asked Wood. "What of that?"

"Who are we to question the power that organizes infinity from end to end, who patterns eternity and draws the ends

of space together? We only know that we are a part of that purpose and mind, whatever it may be, and in the future we shall devote our interests in that direction, supreme in the knowledge that we have intellect and ordered unity that will make it possible. In the old state we could never have done it, never have glimpsed such a thing as this, but now that the metamorphosis is complete, and every intellect understands the other, there is nothing to block our path. Tirelessly, ceaselessly we shall strive toward that end."

With that, the master mind ceased its exposition. The matter universe flowed and vibrated with acquiescing thoughts; the entities broke up and divided into groups, to devise their own particular ways and means of pursuing their intellectual course to the limit.

As hitherto, Wood clung closely to Nick, exchanged views with him, weighed suggestions, devised plans—all of which, along with those of the others, were tendered to the master mind for consideration.

Through Earthly multiepochs, this perpetual arranging and planning went on, leading ever upward to a vital point, until, at last, every conceivable mind in that astounding universe was ready for the forward intellectual drive to the next higher stage—a state to be reached by the pure force of thought against that of existent matter, which, for all its negotiability, was still a mundane and not a pure-thought factor. The state of absolute intelligence had yet to be attained.

An intense calm settled on the assembled multitudes as they waited the given signal to concentrate on the one pre-devised union of thought. Wood waited in silence, Nick floating in disembodied blueness at his side.

THEN came the master's signal, penetrating to the farthest reaches of

that colossal expanse of intelligence. Instantly, every thought was trained in one direction, concentrated on one particular point which, if resolved by the power of the thought, would mean the passing of even electricity and the attainment of the purely intellectual realm.

It seemed to Wood that a roaring broke on his impulsive senses, the first really Earthly noise he had heard since the new existence. It grew with the passing seconds; the electric beings of the universe gyrated and twisted in the most incredible fashion. Their bodies were decomposing, vanishing into the midst of the all-pervading pearly light. Like an expanding ball the disappearing area spread, having as its center the larger electrical personage of the master.

Faster and faster, a swirling enigma, expanding in a throbbing tide throughout the whole enormous area, until at last Wood found himself caught up in the midst of it. His mentality remained clear, but his electric body passed away in a haze of disintegrating blue light. Upon every hand blue explosions were hurtling away from him; the entire matter universe was quaking from end to end, falling in upon itself, collapsing completely.

Then there came a great and vivid light that burst suddenly through the midst of the ruptured matter universe, a searing tide of brilliance. Though he had no eyes, no body, only pure mental conception, Wood could distinctly see what was about him.

A machine! So colossal that it staggered even his abnormal perceptions. In appearance it resembled an Earthly generator, but its lowest point was infinitely higher than the old-time Mount Everest, and the rest of it towered into hazy remoteness and lost itself. Even as he looked, Wood could feel himself moving away from it as if on the crest of an etheric wave. He passed through the

very interstices of another colossal machine, and still went on moving.

An incomprehensibly vast city was the next thing that smote his reasoning. His mentality reeled before it. A city populated by beings not entirely dissimilar to Earthlings, but of such stupendous size that he realized that, had he possessed his Earthly body, he would have been infinitely smaller than the smallest pin point by comparison.

He tried to fathom what these tremendous matter beings were doing, rushing about their city. Then, even as he tried to conjecture, he found himself suddenly and amazingly back again in a matter universe, filled once more with glowing electrical beings, but now considerably larger than before. He felt, too, a sudden and immense stimulus.

Vainly, he tried to imagine what had happened—how the procession of infinite concentration had brought about such an inexplicable state of affairs. Then the vibrations of the master came across the cross currents of astounded mentalities.

"That our universe was an atom in the matter formation of an infinitely vaster universe, we have long known," came his communication. "By the same rule, the primal atoms which Draycott created out of energy were also universes within ours. To make matter out of energy it was necessary for him to literally create universes on a small scale. That he did, and produced matter of an unusual form. That matter was unstable; the atoms or universes comprising it had to adjust themselves to the new conditions. They came, literally, out of anywhere into being.

"In accomplishing the adjustment, they upset every other universe or atom within *our* universe, and ultimately resolved the entire universe into a form of matter. We know how, in the beginning, we found the metallic element

to be comprised of infinite living beings; that has been told to us. They were the beings of the atomic universes already annihilated! Now it has come to the stage where the effect has spread through our universe, which is—or was—really one atomic formation in the suprauniverse encompassing it.

"We have burst our own tiny atom much the same as that metal once burst itself in the research institute. How are we to know but what it burst by a process similar to ours, by concentration of thought from inside it, stimulated by the Earthly electricity around it? Our stimuli, clearly, has come from this suprauniverse's electrical machines. Our former universe existed inside a piece of metal, close to one of the immense machines of this suprauniverse. Could we examine it, we no doubt would find that its electrical powers have ceased.

"Whatever it may be, we know that our bursting our universe has destroyed an atom in this new universe, and that the energy thereof is repatterning itself just as it did on Earth. We have formed again into matter, just as, back on the Earth, the mounds of matter formed when the right balance was struck. So it will go on through this world—the gradual annihilation of matter things and the replacement by those electrical—and from that upward and upward, through suprauniverses as yet undreamed of, a perpetual cycle of change—change—change!

"Ultimately it may bring us, after untold time, to our long-sought goal—pure thought. We know only one thing as yet: change the slightest particle of energy in any universe or world, and it will pass on through all universes, until the whole lot is resolved into an equal balance, so immovably linked is one universe with another. And to accomplish that process will take all eternity and—

"Yes, eternity!"



# Denizens of Zeron

by J. Harvey Haggard

KIRK LORENTZ felt the slimy tentacles of the Ceresian closing about his face, shutting off his nostrils. Those five tentacles might as well have been boa constrictors. His laboring lungs were like spouting flames of pain. His agonized eyes glared

past the corrugated fold of writhing flesh that pinched in his face; he caught a glimpse of the gleaming beryl wall supports, the understructure of the space cruiser. A circular port slid across his vision, giving a glimpse of icy pinnacles against an airless firmament, of glitter-

ing lakes of liquid oxygen undulating near the tortuous stalagmitic ice formations. The voided surface of Zeron, the planet at the end of the universe, swept past his sight. A darkish mist was settling over his brain.

Out of the mist three yellowish, hypnotic eyes came swimming. A pyramid of flesh, colored like gun metal, surmounted the jutting orbs. Struggling in his last throes, the Terrestrial knew that he was gazing into the features of one of the Ceresian blast tenders, who had heretofore been very loyal employees. Through the merging oblivion, he seemed to see the day he and Sloth Gerrick had rounded up the crew on Ceres. There came glimpses of their voyage for radiumite, across the thousands of asteroids in the belt beyond Earth's orbit.

He recalled their discovery of Zeron, the asteroid that swept in an erratic path even beyond Pluto. He and Sloth had been elated, and had landed upon a little world so cold that the very air had solidified. Great ice sheets of carbon dioxide, known as "dry" ice on the Terrestrial planet, covered the surface world of Zeron. Lakes of silvery liquid oxygen rippled around the deepest bases of the frozen pinnacles. The ice was not frosty, but very clear and crystalline, and the prismatic edges caught weird rainbow effects from the saffron rays of the Sun, which looked like an orange against the space that hovered close about Zeron.

His last thoughts were centered on his hands, which were clutching desperately in the leathery folds of the Ceresian's sinewy torso. His hands were burning with acid fire. There had been six blast tenders, six natives to man the rocket blasts that pushed the space cruiser through space.

There were three rocket blasts on each side of the craft, and at each of them a living, sentient being had to stand, with tentacles on guiding instruments, and

auditory instruments attuned to the commanding voice of the Earthman in the forward cabin. It was a crude old crate—as the Terrestrial had well known—but it was the best they could do on their limited funds, so they had cast everything on this mad venture, which was now dissolving into a black gloom of nothingness.

"Kirk!" He heard the voice calling from beyond the rolling mists. "Kirk!" Yes, he knew that voice. "You're not hurt?"

He opened his eyes. An elongated face with sandy brows was staring down at him. A tall, stooped body, clad in metal-lin, stood over him, and at the end of two long arms, massive fists were clenched, one of which was bruised and dripping blood. Down a passage to the blast decks, the Ceresian was disappearing, slithering along in a spidery fashion that revealed its suffering, since one of the tentacles slid uselessly behind, covered with a whitish ooze.

"Sloth!" gasped Kirk Lorentz. "Sloth, you old ape! You got here in time, old son. I was about ready to slide out on the last trip."

The thick, massive mouth of the other split in a wide grin.

"I thought you wuz hurt, Kirk," said the rawboned Earthman. Sloth Gerrick had come from the Outlands of Earth. Though unschooled in many of the finer arts, he knew a great deal about space trails and barbaric planets.

Kirk Lorentz came dazedly to his feet, with pains cutting his lungs in piercing arrows.

"I gave the order to take off," he explained. "No radiumite on this frozen world. Then that blast tender sneaked in, and I thought something was wrong. Before I was aware of it, he jumped me."

"I'll be infernally glad to get off," said Sloth with a queer grin. "This world's too cold for me. We couldn't get off without a double insulite garb, anyway."

He lifted a heavy metal bar, and began hefting it. "I'm thinking we're going to have to bash in a few slimy skulls."

THERE WAS something queer about his attitude. Kirk rubbed his muscles and frowned. He looked past the forward port, past which he could glimpse the icy inferno. Sloth had said there was no use donning space toggings and going out into that, but why should he mention such a crazy thing?

"Feel better, Kirk?" asked Sloth, rubbing his lacerated knuckles. "If you do, you'd better grab a beam or something."

Cold fear was clutching at Kirk's heart now. He had faced the wild tempest of many planetary worlds, but never had he faced the terrible cold that held Zeron in its clutches. He whirled, gazed toward a bulkhead compartment, and saw an empty row of hooks that should have supported caustic guns.

Sloth was grinning in his Outlander fashion, but the grimace was cold and without humor.

"They got 'em, old son," he said slowly. "Caught us nappin'. We deserve it. But I ain't afraid. I'll go out and ram every blaster down their sneak-in' bellies! I'll——"

A dark shape, slithering upon lurching tentacles, came from the lower ramp. In the edge of a tentacle fold a gleam of metallic tin appeared. A moment later the tip had writhed through the trigger guard and the weapon wavered aloft. The xanthic eyes fixed upon the Terrestrials, and a tiny, funnel-shaped orifice in the base of the pyramidal head opened to emit guttural speech.

"You Earth," spoke the harsh, blubbery words. "You our prisoners. Don't try escape."

"What's this all about, Quezl?" exclaimed Kirk angrily. "Haven't we treated you fairly?" The dirty rats! They were getting standard wages in planetary currency. He knew that a keen brain was hidden in pyramidal car-

tilage head structure. Quezl had seemed the most intelligent, and had acted as spokesman for the crew. Yet now his ordinarily serene orbs were seething with a maniacal fury.

"You go there," said the slimy mouth orifice, and a dark tentacle waved toward the ice peaks beyond the port. "You get space tog, and go. We follow."

"Wait a minute!" cried Sloth, waving the bar threateningly. "We go first. You come after. If anything happens to be inimical out there, it grabs us first, and you're warned. We're the bait."

"It is warning of cold god," said the Ceresian. Behind him, five other spidery forms were lurking, like ebon wraiths. Tentacles were lashing. Yellowish eyes glittered insanely. Queer, chortling sounds came from the nauseous mouth openings. "This is land of after. Here our spirit people live, chained here. We free them; you go."

"All right, you nutheads!" burst out Sloth. "Maybe that's right about your ghosts bein' here, but we ain't goin' to be first. We——"

"Don't throw it," cautioned Kirk Lorenz in a low tone. He was not of the physical stature of the other, yet some quality of leadership marked him. His face was livid. "I know these Ceresians. They're wildly fanatic. I know something of their religion. They think that the spirit of their beings is stolen away by a cold god, which they call Zexra, and doubtless they got mixed up when we called this little world Zeron. They think the spirits of their dead people are bound here in ice caverns. It's their Hades, from which the ghost people can be rescued and brought back to life."

"Get tog," commanded the Ceresian blast tender furiously. "Get tog, quick. My brother, Quediv, he mebbe-so die, like you say, and Zexra bring him here. I bring back. You do say, and you come back."

"That's right handsome of you," mut-

tered Sloth Gerrick. "Mightily. What you say, Kirk?"

"They're wrapped in a religious fervor," answered Kirk. "We'd better get garbed and go out. We'll lead them around till they're convinced this isn't their Hell world, and then come back. By that time they'll be cooled off—I hope."

"So do I," growled Sloth. "Anyway, I'll be lookin' for a chance to rap that Quezl on the bean. Him out of th' way, we'll handle th' others."

IT WAS an odd procession that clambered down from the gangway of the cigarlike space cruiser, nestled on a sloping ridge above a lake of liquid oxygen. The two Terrestrials, bulbous in their space suiting, came first, stepping warily down upon the crystalline ice surface. Then the six Ceresians, their podlike bodies sheathed in glassite bulbs, came down gingerly, waving caustin guns in the direction of the unarmed Earthmen.

Naked tentacles were thrust through collar-shaped openings in the glassite sphere. Equipped with multiple lungs, the Ceresians could exist in a vacuum for some length of time, and the leathery tentacles were practically nonconductive, making it possible for them to retain body heat, even though walking across ledges of ice.

It was with ominous foreboding that the Terrestrials climbed over a long table of prismatic ice and saw the familiar outlines of the space ship vanishing over a ledge.

"Above all," radioed Kirk through the headest apparatus, "don't slip. If we got started, and went down into a lake of liquid oxygen. Ugh! Ever see a piece of beefsteak dipped in liquid oxygen?"

"Gr-r! Talk of somethin' nice," growled Sloth angrily, his gauntleted hands clenching. "We got four hours of air in our shoulder tanks, and before that's over, I'm aimin' to have that

ornery blast tender torn apart to every tent'cul."

"Beefsteak shatters like glass, frozen in liquid oxygen," went on Kirk in a voice of caution. "So don't start lurking too close to those oxygen pools or —" A spire of ice shattered under his metal-shod foot, spraying into the air like a handful of crushed glass. Simultaneous with that, he lost his footing. His heart floated in an empty void. Weightlessly, he swung in helpless vertigo toward a crevice that yawned from a gorge, beyond which glittered an oxygen bay. Sloth reached out like a cat. Blood was pumping fiercely through his veins.

"That's a favor," he gasped, but Sloth's reddish features winced behind the transparent eye visors.

"Maybe not," said the other. "Maybe it'd be a mercy to let you go, easy like that. Are the Ceresians still followin'?"

He was referring, of course, to the possibility of their smothering to death, when the atmosphere tanks were depleted.

Kirk gritted his teeth, looked to the rear, and saw the bulbous spheres, supported by writhing tentacles, lumbering across the icy spaces. Before that happened, before their laboring lungs turned the last bit of air to poison monoxide, there would be a showing, even though the metallic tin projectors of the caustin guns could be glimpsed in small, poised tendrils, beyond which were glittering, curious eyes.

KIRK had hoped that the Ceresians, upon seeing no denizens of the icy world, would realize very quickly that this was no spirit world, but a very solid, a very frigid one.

At various times Quezl had stood motionless, as though striving to call to his brother, across the abysmal gulf of death. Yet the awful silence, the iridescent sprays of color coming from vast heaps

of transparent ice, served to impress their savage natures, to create a supernal fear of the unknown. More than ever were the blast tenders certain that this was their Hell world of Zexra.

They had halted on a majestic spire. A steep slope to one side ended in a shivering lake of liquid oxygen. Behind them towered monstrous, jagged cylinders and spheres of ice, jumbled as though from the upthrust of an inflating energy deep in the frozen core of the planetoid, Zeron. Up a jagged chasm, flickering with rainbow hues that changed as the glowering orange sphere which was the Sun climbed to higher prominence.

The Ceresians were grouped together now, on a knoll, and their yellow eyes were glowing in abrupt stupefaction, for they could see new formations peeping beyond the grandeur of colossal ice ridges. Thrown against the peaks were clusters of buildings that resembled monstrous snowflakes, preserving the perfect symmetry of crystal formation. Columns of solid ice rose in military array, bearing the curious edifices, which surely were formed by no freak of nature but by sentient contrivance. Yet the spidery blast tenders were unaware of queer black splotches, sliding along the ice behind them.

An eerie tingle shot up Kirk's spine. At first those odd blotches had looked like mere distorted reflections. Then he realized that no movement should have been evident. Looking closer, he saw swirling vortexes of rainbow color, a pulsating group of swirling blobs. Some of those shapes, floating low over the ice, were cubes, others were tetrahedrons. Yet their solid form, such as it was, was impermanent and changing.

He caught Sloth's armored arm, pointed wordlessly. The Ceresians had noticed the strange pursuers. Spidery forms bounced up and down, as though striving to set up friendly communica-

tion. Amethyst fires spiraled from angular corners of the floating shapes.

"By Gemini!" gasped Kirk. "Those poor fools think that it's the ghosts of their people. Look at them——"

"They're not so dumb," returned Sloth. For he had observed Quezl, leveling a caustin gun, saw the splinter of heat mushroom out. A tetrahedron whirled about ponderously. Greenish sparks paraded about its exterior, and the fiery are seemed to be absorbed by its internal body. A Ceresian lurched on its tentacles, its mouth orifice writhing in some hideous profanation, and suddenly it flung upward, reached out and grasped a glowing cube.

Instantly it stiffened, and, as the cube floated away, crackled to bits of ebon shale.

"Cold life," muttered Kirk Lorentz. "It's cold life. And the scientists thought nothing could exist at absolute zero."

"There are some metals can't," said Sloth. "Do you know what kind of life it is? It looks like metal, under pressure."

"I'd guess helium," returned Kirk, shivering apprehensively. "Of course helium is a gas as we know it, and scientists have tried to reach absolute zero by solidifying it. Here it exists as a solid. We are seeing helium subjected to a terrific cold, and maybe it's lucky that Earth scientists have never succeeded in metamorphosing it, and thus awaking it to a malefic form of life."

QUETZL, the Ceresian, had undergone a rude awakening. For some time a fanatical fervor had swept him. Since he had been convinced that this was the Hell world, he had been seized upon by an inner being that seemed not his own. The Terrestrials who had befriended him had appeared in the light of outsiders. Now his pyramidal head casing was struck with the truth of the situation.

On the ascending ledge, he saw the space-clad figures of the Terrestrials, and his inner being underwent another change. He felt an overpowering horror of the angular motes floating against the voided sky, and longed for the customary protection afforded by the men who had come from Earth.

Quetzl came running, a caustin gun extended in each of two tentacles.

Kirk seized them, tossing one of them to Sloth.

"I thought he'd wake up sometime!" he ejaculated. "Now break for the space ship. I think we can make it if they don't notice us."

The ledges seemed even more slippery now. Of the Ceresians, only Quetzl had possessed enough faith in the Terrestrials to come to their side. Now a desperate battle was being waged on the high pinnacle. A second tender came in contact with the helium beings of Zeron, disintegrating to tiny, shattered bits.

One of the Ceresians slid from view, shot past a gorge that cut out over the lake of liquid oxygen, and fell so close to the fugitives that the twisted expression on the mouth orifice was plainly delineated. It struck the undulating surface. A hollow detonation shook the icy crags, and liquid oxygen was flung in a high wave that rose several times and subsided.

Kirk was as one in a nightmare. Keeping always in the slippery rifts, he sighted the stars in the heavens, and for long moments they progressed as rapidly as possible. The sound of the fray was left behind, now a labyrinth of ice projections held them in its maze.

It was a foolish thing to think of, but an ancient legend kept flashing across his mind. In the myth, the hero had unwound a ball of yarn through the labyrinth, and he wished suddenly that a strand of yarn would lead them unerringly to the space ship. Some of the ledges appeared as though gnawed out by monstrous termites. That was a

crazy fancy, also. He had to hold on to his mental powers. He mustn't slip now. There was something vague in his recent memories, something that had sounded a resonant note in the back of his brain.

The Ceresian had stumbled, had fallen into the lake of liquid oxygen. There it had burst apart, had flung the silvery spray high across the stars. Why! Why! The thought and the question beat a tattoo in his laboring heart. Beads of sweat crawled down his forehead, dripped across his eyes, and the brine smarted. It was hard to think of his body, perspiring within the space toggings, and all that ultimate cold on the outside. One tiny crack in the beryl armor, a splinter across the transparent visor, and his body would shatter in mid-action.

THEY HAD CRAWLED up a crooked canyon, had approached a notch of the stars through the ice, and now they halted, dismayed. A monstrous structure, like a fat snowflake, reared against the stars, supported by cylindrical pylons. Clustered below it were other structures. They had stumbled upon a circuitous route that had led squarely across a village of the helium creatures.

An ominous shadow passed across the surface of ice upon which they stood. Sloth's face was bitter within the visor. He pointed a stubby hand toward a lower slope. An elongated object, solid and beautiful in every outline, rested there, across the lake of liquid oxygen. It was their space cruiser. So near, and yet so far.

"Don't move," whispered Kirk. "If we don't attract their attention, we——"

"That lousy Ceresian!" snapped Sloth wrathfully, as Quezel cowered to a position between them, his tentacles fairly dancing. "He's fixed us, already. Here they come."

The firmament was blotched with floating shapes that swarmed from the

crystal city of the denizens of Zeron. Angular bodies, surrounded by pulsating auras, descended slowly. Sloth aimed the caustin gun, jerked the release. The upthrust of energy sent his large body recoiling. Yet the arc of heat was absorbed by the upper attackers and showed no ill effects. His armored hand clutched tightly upon the butt of the weapon. The glint of metallic tin caught Kirk's eyes.

"Listen, Sloth!" he shouted hysterically. "You saw the blast tender, the Ceresian, fall into the lake of liquid oxygen. You saw that, didn't you? The outside temperature of this world must be close to absolute zero. And he held a caustin gun in his hand. It was made of metallic tin. Wasn't it?"

"No good, old son," snarled Sloth. "We're up against a stump this time, and no way out. Too bad you can't make it. I'll hold 'em and you tear outa here, with Quezl! The guns ain't no good."

"Not that way," returned Kirk, his voice so shrill with elation that the other turned and peered incredulously. "I'm not mad, Sloth! But not that way! If you had a bomb, Sloth, a bomb in your hand, could you creep out on that ledge and lay an egg in that crystal city?"

The folds of skin on Sloth's cheeks were tugging back querulously. His fingers moved greedily, housed in beryl covering.

"Could I!" retorted Sloth. "Could I? Just you put a bomb here in my hand, old son."

"You've got one," exclaimed Kirk. "The heat charge in the gun is of no use. But it's made of metallic tin. You said yourself that some metals could stand absolute zero, and some couldn't. Metallic tin is one of the metals that can't. Our body heat has kept it above the absolute zero of the outer world, but if you'll drop it into that city, the temperature will go down in a jiffy. Yet it's estimated that metallic tin, reduced to

absolute zero, will be under an internal strain of three thousand times the pressure of atmosphere, and so be forced to expand."

Sloth was grinning. There was something terrible about the grimace of the Outlander from the Terrestrial planet. Quezl, the Ceresian, quailed away as Sloth's thick mouth opened to give forth cavernous chuckles.

Then, with a deceptive grace, he had bent and was running forward along the ridge. He paused, braced for a moment with the caustin gun gleaming against the liquid oxygen pool that lay below. Then he had hurled the weapon out and downward. It cut a curved streak against the stars, dipped down, descended into the towering structures.

In that moment the universe seemed to shatter. Somewhere in the near vicinity, an avalanche was aroused into being, grinding down to slide into the oxygen lake. A tumult of outraged liquid arose, seethed in a glittering maelstrom. Kirk was on his feet, crawling out along a quivering ledge.

"Sloth!"

A bulbous helmet came slowly upward from behind a splinter. Sloth's triumphant visage beamed from within the transparent panel.

"Don't worry about me, old son," came the answer. "I'm all ready for a dash down toward the cruiser. How about you?"

Kirk Lorentz pushed the frantic Ceresian from between them. He looked down at the metallic weapon in his own hand and up at the few heliumite denizens that floated high above. In the lower distance, the beryl hull of the space cruiser lay like a gem in a torn setting. For a long moment he stood, gauging the route they would have to traverse around the shores of the oxygen lake.

Then they walked down into the icy chasm.

# COSMIC GOSSIP

## *A Study of the Solar System*

by John W. Campbell, Jr.

**A**FTER NEWTON missed the spectroscope, in 1666, over a century and a quarter passed before any one made the great discovery. In 1802, Wollaston used the slit that was to make the spectroscope possible.

Basically, the prism spectroscope to-day is the same instrument that Wollaston discovered, refined, however, almost infinitely. A ribbon of light, defined by the edges of an adjustable slit, passes through a series of lenses that make it sharp-edged and narrow as possible. It enters the prism, which bends the light, each wave length to a slightly different degree, and so forms a long series of images of the ribbon of light that entered, each a different color.

After the original discovery, accuracy in the spectroscope came to be synonymous with greater definition, thinner and still thinner wedges of colored light, so that ever more strips of color, more slit images, could lie side by side in the rigidly limited width of the rainbow pattern the prism gave. But there was one great difficulty: the thinner the slit, the better the results so far as color spread went—but, if you try to illuminate a five-inch-long area one inch deep by the light of a slit a hundredth of an inch across by one inch tall, the illumination becomes so diluted you can't see the beautiful, sharp lines the slit would be throwing.

It is no wonder that in 1810, 1820 and those first years of the spectroscope most spectroscopic work was done in connection with sunlight. You could dilute sunlight a whole lot and still have enough to see, but when artificial illu-

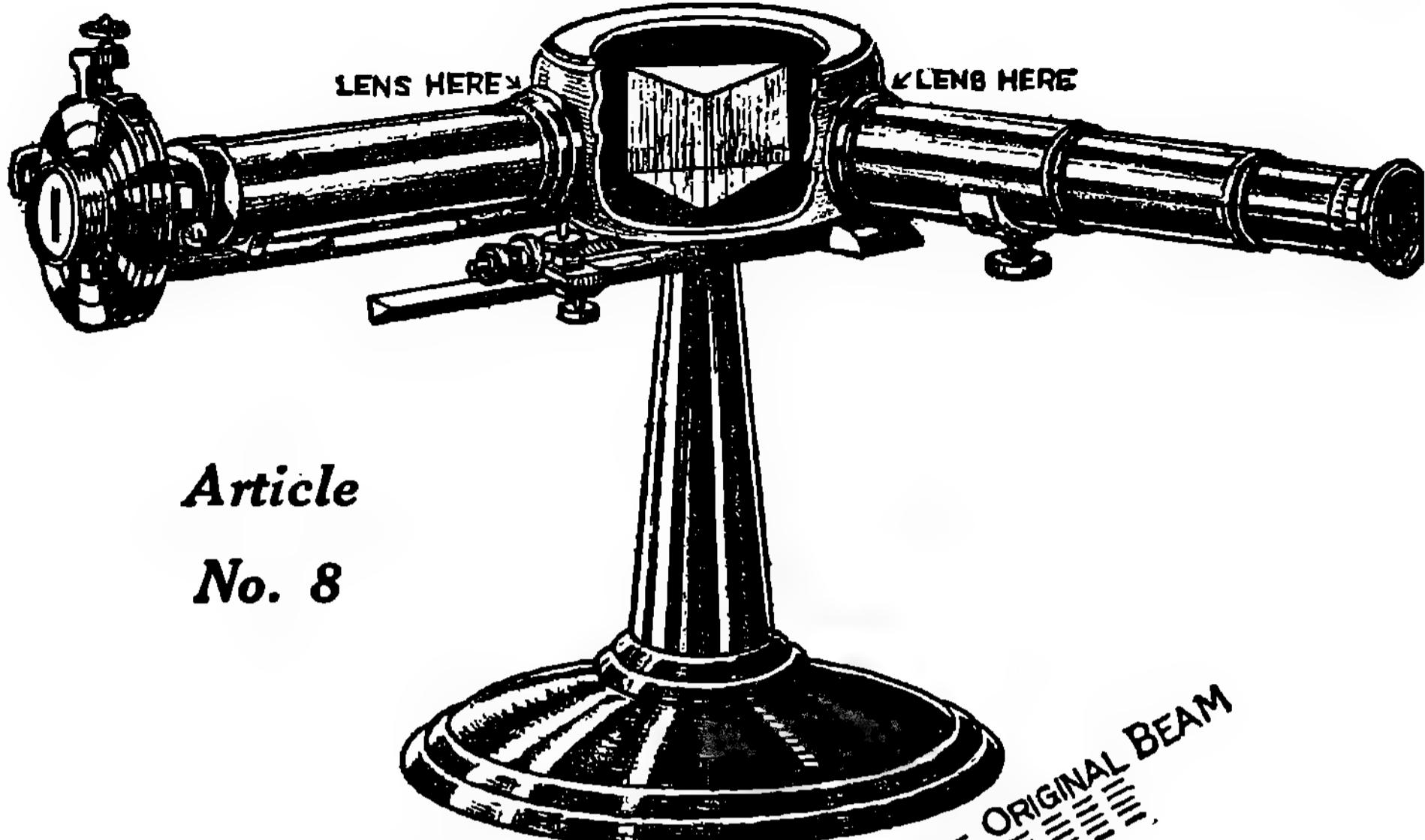
mination consisted of candles and oil lamps, artificial light sources simply gave the struggling spectroscopist grief. Artificial light, the development of the electric arc and the electric furnace, the gas-blow tube, have all been immensely helpful to him. An even greater thing was still in the future when those pioneers went to work: photography.

But for all their besetting troubles, they must have had a glorious time with that new instrument! Fraunhofer was the first to record the strange, inexplicable black lines that crossed the brilliant spectrum of the Sun. They'd tried all sorts of illumination: bits of metal heated in the hottest flames they could get, the fierce glow of their furnaces. Those all seemed much like the light from the Sun—somewhat redder, of course, but much the same otherwise—yet those sources never gave the black lines Fraunhofer recorded.

Then Bunsen, with a gas flame and a bit of table salt, showed the origin of those black lines. Then came Angström, and the measurement of the wave length of light, and the naming of the Angström unit of wave length.

IN the middle of the 1800s Kirchoff did for the accumulated mass of data produced by many workers what Kepler did for Tycho Brahe's accurate astronomic observations. He integrated all the findings, deduced from them certain principles, and set them forth as the laws of spectroscopy. Briefly, the data and the laws were these:

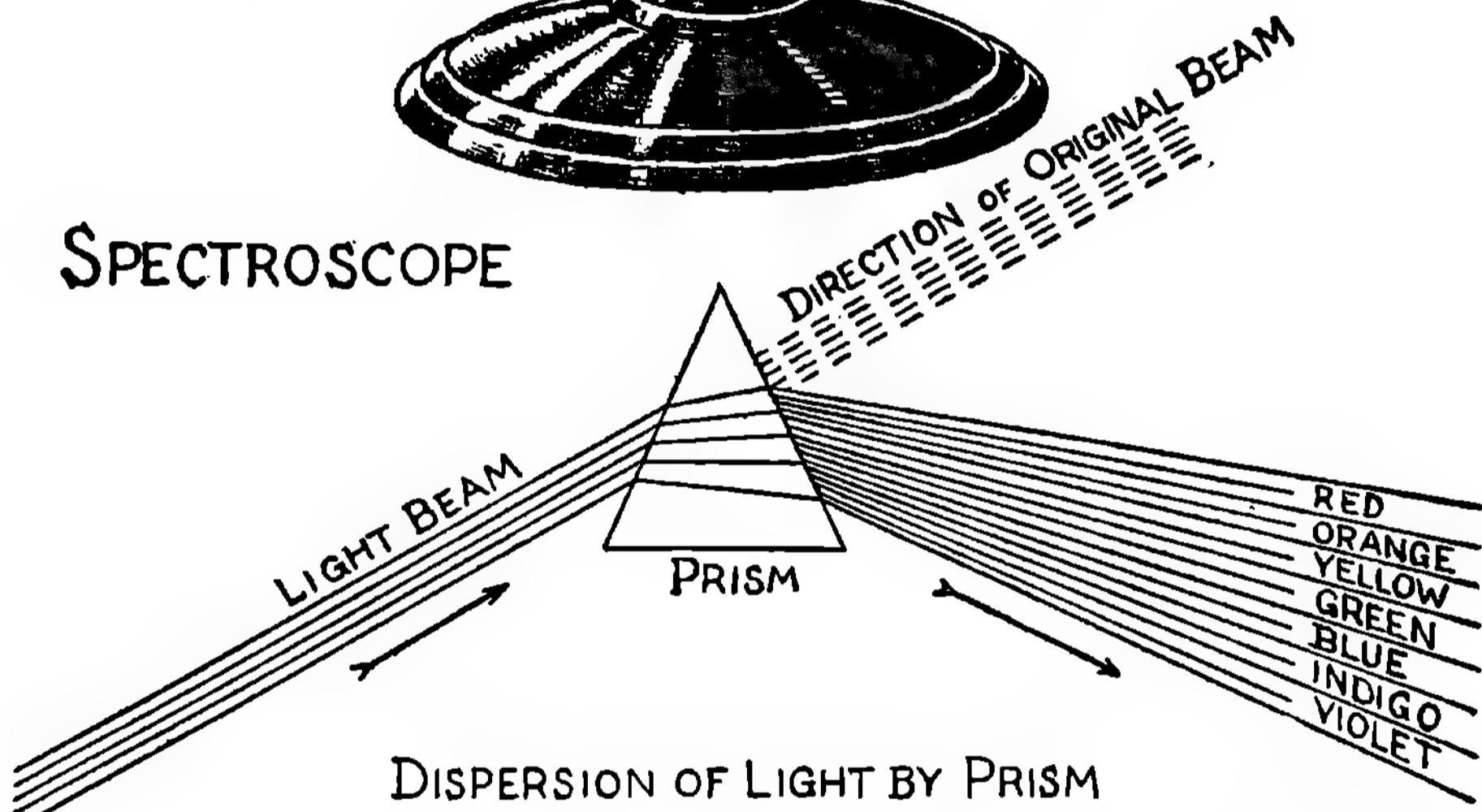
Incandescent, molten iron, molten copper, the fire brick of the furnace



## Article

### No. 8

## SPECTROSCOPE



that holds them, all give exactly the same result in a spectroscope; no matter how great the dispersion, how great the resolving power, the result is a continuous spectrum, a smooth blending of one color light into another. Some parts of that spectrum will be brighter than others; with molten antimony metal, which glowed a dull red, the spectrum was strong in the red end and scarcely visible in the blue. With molten iron, the spectrum was stronger yet in the red, but the strongest part came toward the yellow, with the blue quite visible now. Molten platinum gave a still bluer spectrum.

But that meant little, because molten

iron heated to the temperature of molten platinum would give exactly the same result. And even gases under very great pressure did the same, any gas.

So the first law of the spectroscope was: a solid, liquid, or gas under great pressure, radiates a continuous, featureless spectrum, the position of whose maximum intensity shifts toward the blue with increasing temperature.

Further, and much more interesting, they had found that if sodium, for instance, were dropped in a flame, the flame was colored yellow, and in the spectroscope the burning gas gave two intense yellow lines which were produced by any sodium gas burning, however it

was derived, whether from table salt or from animal tissue. And no other substance ever gave exactly those lines.

The second law of the spectroscope was: a radiating gas under low pressure gives a spectrum consisting of bright lines, the position of which, and the relative intensity of which are characteristic of the chemical constitution of the radiating gas.

Bunsen had explained Fraunhofer's lines, and had shown what caused them; a cool gas under low pressure between the incandescent photosphere of the Sun—which was a radiating gas under terrific pressure, and as is to be expected, gave a continuous spectrum—and the spectrosopes on Earth. It was easy to show on Earth by boiling a bit of sodium metal in a closed glass vessel so that no burning took place, thus giving a layer of sodium gas at a fairly low temperature, and focusing a spectroscope through it at an incandescent solid. The result was a smooth, continuous spectrum, save for two black lines exactly where the bright yellow lines of sodium would have been, had the sodium gas been the radiator.

The third law of spectroscopy is: if, between a source of a continuous spectrum and the observing spectroscope, there is a gas under low pressure, there will be black lines crossing the bright spectrum in exactly the position the gas would give bright lines were it radiating.

The fourth law of spectrum analysis is based on literally un-Earthly data. It is the Doppler principle applied to light; if a radiating source and a spectroscope are relatively approaching each other, the spectrum is displaced toward the blue; if they are relatively receding from each other, the spectrum is displaced toward the red. The degree of displacement depends on the relative speed.

That highly important principle applies in astronomy most noticeably. If a star is approaching the Earth, and

the spectroscope shows the typical calcium spectrum, but displaced well toward the violet, we know the star is moving in our general direction at a fast clip.

BOHR gave a general picture with his solar-systemlike atom, a nucleus with electrons circling it like planets circling a sun, in orbits far out. But the atom he pictured was a rigid structure, more like a model made up of steel balls on springs. The shorter the radius of the electron's orbit, the stiffer the spring that carried it, the more massive the nucleus, the more electric charge it carried and the stiffer grew the orbit electron springs. Thus light hydrogen, with one electron at a short distance, gave a spectrum in the visible range, while enormously massive uranium, heaviest of the known atoms, gave a spectrum in the visible range only with the electrons which were far out from the nucleus; electrons at the distance from the uranium nucleus that hydrogen's electron is from the hydrogen nucleus acted as though on such enormously stiff springs that they vibrated far too rapidly even for ultra-violet, far in the X-ray range.

Further, an atom robbed of an electron was left with an unbalanced electric charge, and stiffened up as though to defend itself against further loss. Thus a neutral atom of calcium would give a red spectrum, but robbed of one electron, the stiffening resulting would make the next electron vibrate far more swiftly in the violet, or ultra-violet.

But light had at last begun to tell its story. However, almost as soon as photography had made it possible to get the ultra-violet range of the spectrum, men found out that while light had an enormously interesting and important story to tell, the telephone line was faulty. The Earth's atmosphere, high above the stratosphere, contains a layer of ozone, a special compounded form of

oxygen produced by the action of electrons shot out by the Sun, and this ozone is as opaque to ultra-violet as so much cast iron. That left about one third of the ultra-violet range, the visible, and the infra-red—much good might it do them. They couldn't get anything at all in the infra-red because photographic plates were not sensitive to it.

The result was that such elements as boron could not be detected, even if they were in the Sun. The spectrum of boron is far in the ultra-violet. In fact, nearly all the nonmetallic elements give spectra in the ultra-violet. The metals were easier—except for some like caesium, which ionized so easily that it promptly became an ion, with a spectrum in the ultra-violet also, where it couldn't be reached.

To this day, we have not proven the presence of such common elements as chlorine, bromine, neon, argon, gold or bisniuth. We have only within the last few years found phosphorous, and then only because plates were developed which were sensitive to infra-red and could find the line far, far out at 10,000 angströms. (7200 is the limit of human vision).

Boron has been found, despite the fact that the element does not give an attainable spectrum, because it forms a compound with oxygen stable at even that tremendous temperature, and the compound does give a visible spectrum. Silicon and fluorine have been found similarly, by the presence of silicon fluoride.

NEXT comes the problem of how much? From the strength of the spectrum lines, we can form an estimate, taking into account the fact that some elements, such as calcium, have enormously strong lines, while the same amount of lead would give very faint lines. Further, some elements can be identified only by the lines of the ion-

ized atom, and the ionized state is the wreck of an atom, a special condition, occurring only when an atom has been violently treated, and accordingly only a small percentage will be in condition to give that line.

Thus, working back from a line on a bit of glass plate, we must estimate the number of atoms needed to produce it, then estimate what percentage of atoms would be ionized under those conditions obtaining on the Sun, and so derive the whole number of atoms of that element.

Through laborious work, fairly accurate estimates have been made possible. We can compare these estimates of the commonest metals in the Sun, with similar estimates of the most plentiful metals in the whole Earth—including the core, as derived from the study of meteorites. As might be expected, the analysis shows that the Sun's metals agree very closely in relative plentitude with those of Earth. The table below gives the most abundant metals in order; the first group is approximately ten times as plentiful as the second; the second, in turn, ten times as plentiful as the third.

<i>Earth</i>	<i>Sun</i>
Iron	Magnesium
Magnesium	Sodium
Aluminium	Iron
Nickel	Potassium
Calcium	Calcium
Sodium	Aluminium
Potassium	*****

Titanium	Manganese
Chromium	Nickel
Manganese	Chromium
Cobalt	Cobalt
*****	Titanium

Copper	Vanadium
Vanadium	Copper
Zinc	Zinc

Now come the nonmetals, such things as silicon and oxygen, hydrogen and sulphur. Silicon and oxygen seem to be about equally abundant in the Sun and on Earth, in proportion. But carbon appears to be about ten to one hundred times as abundant in the Sun.

But right there the similarity stops. Hydrogen in the Sun is three hundred times as abundant as all the metals put together! Nitrogen is even more widely off; it is ten thousand times more abundant on the Sun! And helium, argon, neon, the rare gases of the atmosphere? From various indications given by hotter stars than the Sun, it would appear that the Sun has five hundred million times more neon, in proportion, than the Earth!

In other words, compared to the Sun, the Earth has practically no atmosphere at all. Put this way, the answer is not hard to see. At some remote past time, the Earth was torn out flaming hot, the gases blazing at immense temperatures. No mere six or eight thousand degrees, but the temperature of the invisible, incredibly hot, deep layers of the Sun. So hot that the light gases, impelled by heat motion of the atoms giving velocities of dozens of miles a second, shot out into space, beyond the Earth's gravitational grip. But—not from such an Earth as we know to-day, a monster planet, gorged with light gases, for, before they escaped, Earth must have been ten times as massive as it is to-day!

**BUT THEY ESCAPED.** Fastest of all, because lightest of all, hydrogen escaped, and, in escaping, carried with it much of the heat energy of the planet, rapidly cooling the remainder by its swift expansion into space. Behind it flew helium, nitrogen, vast quantities of oxygen, carbon—yes, for carbon was

a gas at that still-tremendous temperature—the inert gases neon and argon.

But much oxygen was bound to titanium and calcium, iron and aluminium and silicon in heavy molecules that could not break free. Much nitrogen was caught with carbon in cyanogen—a carbon-nitrogen compound stable at high temperatures. The active gases were trapped by the heavy substances they combined with; the inert gases escaped. Hydrogen, though fairly active, escaped because there was such a vast amount, and it was so light.

So a cool Earth resulted, the last of the hydrogen uniting with oxygen to form water, the water in turn breaking down many of the compounds that had formed in the hot, new world. The excess of oxygen united with carbon to carbon dioxide, till that still far-future date when life should appear to drive it out to join the cool, and now utterly inactive nitrogen in the air.

Earth was made. And so must Venus and Mars and Mercury have been made, Mars and Mercury losing even more of their atmosphere, since they were even lighter planets.

And what, one wonders, of Jupiter? Immensely heavier, immensely more massive metallic core gripping far more strongly the volatile hydrogen.

That hydrogen never escaped in anywhere near the degree it escaped Earth! It is there to-day, and Jupiter is, by it, made a world of weird seas, and weird, alien chemistry, a world of strange atmospheres and oceans, whose constituents not even the science-fictionists have imagined!

Yet—a world of an ideal climate on an alien basis, a world where life can more readily exist than on any other planet, save perhaps Earth alone!

# You'd Be Surprised

*You really would be surprised if you knew how much of my time is taken up by reading and classifying the suggestions and reactions your letters contain, as a composite opinion. But this work is, in its actuality, pure science, for science is in its essence the classification of knowledge.*

*As we go to press, the composite opinion concerning the inception of "Science Discussions," is beginning to take a definite form. It is one of coöperation, of pleasure at the step forward; yet tinged with a slight hesitation as if, in changing our title from "Brass Tacks," we were losing an old friend.*

*But we aren't losing anything. Take my word for it. Our overcoat, worn steadily for three and a half years, is getting threadbare—so we're getting a new one. We may have pleasant memories of the old one, but the new one will be warmer, and we'll be able to step out more proudly. No more trying to hide the frayed cuffs!*

*Science is a slow, orderly progression, always forward. We want our magazine to bespeak scientific progress. We have too proud a record to permit us to slacken our pace. Science-fiction dreams the actualities of the future. Science articles portray our knowledge of the present and its practical application to universal advancement.*

*You and I, each in our small way, may help to contribute vital thoughts to the general science, and *Astounding Stories* will be our medium of expression. In no other way could you reach an audience of scores of thousands whose interest is centered in the same thought channels. In no other way could I open the door to your thoughts.*

*Life as a whole is a magnificent spectacle. The life of an individual is unimportant, UNLESS that individual contributes some thought to the whole.*

*New life has come into the whole vast body of science-fiction followers during the last three years. Willis Conover is spreading the gospel in his new "Science-Fiction Correspondent." Olon F. Wiggin is in the field with a supporting paper. "The Observer" is appearing in more elaborate form. And there are enough others to bring the list up to more than a score. All of these discuss likes and dislikes with their own groups; and each group serves to intensify the interest in science-fiction as a whole.*

*Thus we progress. And thus I hope we will find ourselves stepping forward into a new era of interest and usefulness with the inauguration, next month, of "Science Discussions."*

*The Editor.*

# INFRA-UNIVERSE

*Concluding a thought-stirring two-part novel*

by NAT SCHACHNER

## IV.

JIM WENTWORTH was no longer Jim Wentworth. He was an alien entity, a being of the Infra-Universe, his identity submerged by the overpowering pressure of an intellect immeasurably superior to his own; his body, lithe, hard with the muscles of Earth, the unwilling host of a formless, colloidal ooze. It was a nightmare sensation. Added to this was the realization that Claire Gray and all of his fellow colonists on the ravished segment of Earth had likewise been preëmpted by the invaders, and were even now being carried out of sight into the strange cerise infinity of the Infra-Universe.

Yet he could do nothing. He was helpless, will-less. His body moved in obedience to desires not of his fashioning. Perforce his anguished self must go along, willy-nilly.

All about him the Earth fragment lay in a deathlike silence. The lush fields were void of human forms; the distant Harbor House, only minutes before astir with men and women, was a motionless desolation. He was alone!

Yet not alone. More horrible than mere solitude was that choked feeling of an interstitial presence, the sight of hundreds of other-universe invaders, slithering amoebalike over the fields, along the road, seeking with avid eagerness more human beings into whom to penetrate.

There were no more!

They flowed in a viscid river toward Jim. His mouth opened. A queer,

snakelike hiss came forth, ran sharply up the scale. His struggling, submerged mind understood. They were being warned off; one of their fellows had already preëmpted him.

The formless masses retreated, disappointed. Then, as one, they raised swiftly into the air, shot upward with accelerating velocity, past the sharp cleavage of the atmosphere, into their own cerise space, straight for the sinister loom of the green planet.

The trinity of multicolored suns was somehow pale and wan in the dull-green emanations of the invader. The graceful silver sphere was nowhere to be seen. It had fled in mortal fear to the farthest reaches of infraspace. A pinkish void spread featureless in all directions.

SUDDENLY, Jim Wentworth's body hurtled upward, following the fast-disappearing denizens of the green planet. He struggled desperately, in the still independent niches of his own mind, to control the muscles of his soaring form. But all nerve connections had been snapped. He was a floating entity, homeless within himself.

A powerful intelligence stirred, pressed relentlessly upon his helpless senses. He tried to cry out. His cries were voiceless. The pressure grew insupportable. He was like a drowning man, gasping frantically for air. Then, suddenly, the pressure released. His mind rebounded to normal functioning. Alien thought surged through him.



*"I am now Jim Wentworth—a hyper-universe creature. Before that,  
I, one of Arimuz, had no name!"*

"This is but a foretaste, Jim Wentworth, of what will happen if you struggle, or attempt to cry out your identity, or try in any manner to thwart my will when we join our fellows," it said.

For the moment wonder pervaded Jim; wonder that this Infra-Universer denizen of his body knew his name. Then he realized. It was in possession of his physical brain, of all the neurone tracks and memory synapses. It held his memory, equally with his own voiceless self. Even as Insar, back on an infinitely remote Earth, had inhabited and known the past of Matthew Draper.

The knifelike edge of their atmosphere loomed directly overhead. They were catapulting toward it, were through, like a sundering sword; then the strange outer space infolded them. Involuntarily, Jim's submerged brain tried to hold its breath. Yet the alien inhabitant betrayed no darkening fear. Jim's nostrils flared; his heart beat tranquilly; his lungs expanded and expelled, even as within Earth's atmosphere. Yet no air had entered his quivering nostrils. How could it? This Infra-Universer space was airless.

The preempting intelligence condescended to answer his voiceless wonder. "You need not fear, Jim Wentworth," its thought beat within him. "Your body is as precious to me as ever it was to you on Earth. I shall guard it as far as possible from all harm. Our space is not the lifeless, hostile void it is in your universe. True, it is neither matter nor thought, the two vital principles of all the universes. But neither is it sheer emptiness. Rather is it the inchoate substratum from which matter and thought originally sprang, from which we ourselves evolved æons ago.

"Thus, there is no sharp line of differentiation, as with you. Matter, structureless as ourselves, limited in its precise functions as yourself, is nevertheless at one with its ancient mother, Space, and imbibes through every nook

and cranny of our beings the requisite impalpable elements for continued existence.

"Here, in our universe, your body will require no air, no food, no drink. There is none, in the crude, literal sense of your own imperfect universe."

Jim looked fearfully ahead at the swift-spreading disk of the green invader. He had accelerated almost to the speed of light. It seemed to him as though his possessor were straining every nerve to catch up with his fellows, to enter the dominion of the virescent world on the very heels of the others. At least, he thought thankfully, he might once more see Claire and the other colonists. Who knew, perhaps by some unknown means, he might even be able to rid himself of his incredible incubus, and free the others?

"That will be impossible," said a voice within him calmly. "Your limited Earth intelligences could never rid themselves from the mighty beings of Orimuz. Only one way—" The thought ceased abruptly, as if he had said too much.

Jim had been stunned for a moment. He had forgotten that his thoughts were part of the infolding being as well as of himself. Now he inquired eagerly, "What way?"

"You shall never know," retorted the other in seeming anger. But Jim had caught a faint image in his consciousness of the fleeing silver sphere, by name Aldahor, and was content. Meanwhile, he blanked his thoughts against the prying inspection of the other.

THE GREEN WORLD of Orimuz swelled to enormous proportions. It obliterated the whirling suns, became the universe. The thin sliver of Earth was a puny, inconspicuous speck in the farther void. Yet neither one nor the other was up or down. Gravitation had ceased with the upper limits of Earth's tiny atmosphere. Here, in Infra-Universer, space was flat, featureless, un-

warped by the matter which it had spawned. Only the tension of the surrounding hyper-universe, of the galaxies, held it within bounded circumscription.

They hurtled closer. With eyes that were his, and yet not his, Jim stared at the sinister wonder of approaching Orimuz.

Its surface, a dull, light-quenching green, seemed pock-marked with thousands of tiny craters. Concavities that were veritable shallow cups uplifted from the surface on slender stems. They shimmered and danced and sparkled with an inner, fiery green. Like a myriad brightly poisonous flowers, Jim thought. Within their cupped depressions lay, motionless, quiescent, the structureless beings of Orimuz. They who had sallied forth in hurtling invasion of the fragment of Earth, and had returned in bitter disappointment because the extra-universe bodies had been too few for all to clothe themselves. They seemed lifeless, bereft of motion or sensation.

"It is not quite as you think," remarked Jim's preëmptor. "They are alive, yet not quite alive. Thought spins its web within their being with slow but inexorable filaments, æons long in the process, but mighty as the universe itself. Thought and matter are inextricably intertwined. But, in the presence of alien, differentiated structures as yourself, thought dissociates, becomes more subtle and active. The vast web of a boundless time is compressed into small compass, and becomes the mightier for it."

Again that strange analogy to the ultra-viruses of Earth flashed through Jim. Those mere molecules of organic life-hovering that become immensely active, multiply and spread, in the presence of living tissues. The carriers of dread plagues to suffering humanity.

The body of Jim Wentworth sped over the vast green surface, over countless passive Orimuzians in their virescent cups, toward a huge amphithe-

ter, countersunk within the lusterless surface, and orbéd over with a gleaming bubble of transparent yellow. The ground swept closer and closer: the shimmering dome reared to tremendous height.

ABRUPTLY, he checked his forward rush as a panel thrust open and a hideous being catapulted out to meet them. Jim, helpless within himself, felt a wave of swift revulsion spread over him. A distaste, seemingly, not merely of his own emotions, but involving as well the hatred and loathing of his Orimuzian captor.

A grating, hissing sound emanated from the tiny monster. Somehow, by some filtration of the enveloping intelligence, Jim was enabled to understand. A sentinel's challenge, suspicious, wary.

Jim's mouth opened, and there issued an answering series of hisses. An explanation. He, the entity, an Orimuzian, had been fortunate enough to clothe himself in a body from the alien speck of matter that had so mysteriously appeared in their universe. Unfortunately, he had had to search long for this queer life being; his fellows had gobbled up the scanty numbers in an incredibly short time. That was the reason he was returning alone, long after his comrades had made their obeisance and reported to almighty Kam.

The sentinel glared out of his solitary eye, hissed ungraciously, and drew aside to let him pass. He floated through the orifice. In so doing, he passed close to the leering monster. Jim's body swerved away, as if mere contact were incredibly repulsive.

There seemed hardly sufficient reason for overpowering hatred in the mere appearance of the sentinel, hideous though it was in all conscience. He was a bare two feet in height, jet-black in hue, body chain-mailed like that of an armadillo, hairless, and with a single Cyclopean

eye glaring lidlessly from what should have been a forehead.

To Jim there seemed a sense of terrific weight and solidity to that tiny form, of a compression beyond all Earth experience. On his chest a hyperbolic mirror glowed a sullen green; yet Jim sensed that horrible destruction could lash forth from its shallow depths at a gesture.

Then he was carried past, willy-nilly. The alien infolding intelligence beat about him in corroding wrath, almost suffocated the Earthman's finite mind. "Why," demanded Jim feebly, "do you hate him so? Isn't he, also, a captive body to one of your own kind?"

"No!" was the vehement answer. But almost immediately came a hasty, correcting thought: "That is, yes. He is the outer shell for an Orimuzian." Bitterly, "A denizen of your universe, Jim Wentworth. He, and others like him, once dwelt on a planet that circled the white dwarf companion of Sirius."

"That's the incredibly heavy sun," exclaimed Jim. "The one where a pint of stripped-nuclei matter weighs about twenty-five tons!"

"Yes, and its planet was even more densely compacted. As the ages passed, the nuclei, under the unbelievable gravitational weight, collapsed inward upon themselves more and more, until a pint would have weighed over two thousand tons. At that terrific density, the crushed matter warped its surrounding space completely around itself, and ripped free from the feeble gravitational influence of your hyper-universe. It fell into ours, and with the planet came its inhabitants, of similar mold."

"And your comrades seized upon the bodies?"

There was a pause. "Some of the Orimuzians did," the entity answered with seeming reluctance. "Praise to the ten universes, there were comparatively few."

"Why do you give praise?"

"Because," retorted the alien with unwanted vehemence, "they—or rather the resultant combination—proved thoroughly evil. Even to the other Orimuzians. Through many æons they have degenerated until their own fellows avoid them. Now they are merely the unscrupulous instruments of Kam."

"Kam?" echoed Jim inquisitively.

But there was silence.

HELPLESSLY, he was hurried along. There was nothing he could do. Despair crushed Jim. Ahead loomed an eternity of hopeless subindividuality, of a gray and endless nonentity—not only for himself, but for Claire, for Matthew Draper, for all the men and women and children who had been his companions in this tremendous adventure.

Darkling wonder, too. There was a mystery about his captor. Seemingly, he was one with his fellow Orimuzians, yet there had been certain signs, certain indiscretions!

Then all was lost in awareness of the fantastic world through which he was hurrying. The great amphitheater was pitted with funnel-shaped orifices. They seemed to lead bleakly into the interior of the planet. From them issued, and reentered, like streams of scurrying ants, a horde of tiny beings, similar to the sentinel who had challenged him at the outer bubble. Their dwarf compactnesses staggered under incredible loads, a hundredfold their size.

From the dark interiors flashed out, intermittently, dazzling violet emanations, more intense, though queerly like, those which Insar had controlled in Draper's laboratory back on an infinitely distant Earth. The bowels of the planet rumbled steadily, and the amphitheater shook with the constant vibrations of deep-hidden machinery. Others of the black dwarfs were busy setting up strange hyperbolic reflectors, of a dull-glowing green, at the mouths of the

orifices. They all pointed in one direction.

Jim tried to follow their baleful focus, but his eyes were intent on something straight ahead. He was a stranger in his own body. Yet, intuitively, he realized that the threat of the reflectors was concentrated on the fleeing silver orb of Aldahor, and that Orimuz was straining every resource to overhaul the fear-stricken planet. A tremendous chase across infinity!

Directly ahead, a hundred Earth miles on, in the very center of the hollow round, loomed a blood-red tower. It tossed fantastic battlements into the emptiness of the overarching yellow transparency, but was itself opaque to the view. Up to tremendous heights it reared, Pelion piled on Ossa, ever receding in a step-back pyramid, until the huge central pinnacle pierced through the inclosing bubble, and thrust its sharp spire out into the encompassing void.

At the rate with which his volitionless feet were skimming the concave surface, he would reach its base within the minute.

## V.

VAGUELY, he was aware of a reluctance within himself to enter that tower. But, for the first time, he realized that he was not unobserved. A pale-violet beam was focused on him, directed from the entrance to the amphitheater, flashed by the sentinel who had accosted him, following every move. His alien other self was heading for the grim central structure because he could not help himself.

Then, with a rush, he was there. Dwarf guards stared at him with single baleful eye, ungraciously waved him in. The smooth red wall misted, wavered, disappeared in an oval section. Before Jim knew exactly what had happened, he was inside, and the wall was a solid, fissureless sheet behind him.

He blinked; that is, he would have blinked if eye muscles were under his control. He was a tiny, inconspicuous being in an immensity of space. Miles on miles stretched the vast interior before him; miles on miles removed was the vaulted roof.

In the center of the great inclosure loomed a thronelike chair, a thousand yards in height. Seated on this inconceivable throne was an even more inconceivable being. In all the hoary memories of Earth's elder giants, there was no mention of any giant like him. Even seated, he towered a mile into the central structure. His legs were endless columns; his thighs and trunk an interminable structure; his head, recessed in perspective distance, a planetary orb. A being of godlike size and proportions! Yet, curiously insubstantial.

For he was a mist, a glowing, iridescent fog of widely spaced molecules, a fiery portent like the vacuous tail of a comet. Even as the black dwarfs, who seemed mere scurrying ants on the floor of the great tower, had impressed Jim with a feeling of incredible compactness and weight, so did this mighty being seem like a spacious tenuity, containing in all his frame a mere thimbleful of solid matter.

Around him, like lesser dignities, sat six others, like himself, yet only a mere thousand feet or so in stature. Giant-esque in their own right, but dwarfed by the overtopping vastness of the mighty one.

This, then, was Kam!

Jim's thoughts went round and round in a tiny circle. The entity who dwelt within him was taking no chances. A strange yearning, and a stranger hatred surged inward from his superfinite intelligence, beat upon Jim's bewildered mind in furious storm—as though the outer round of the entity's thoughts had been deliberately masked from the probing mind of Kam; as

though, nevertheless, an outlet for otherwise insupportable emotions was required.

"Who are you?" There was imperiousness in the wave of thought which emanated from Kam; there was tyrannical abruptness and a sudden suspicious glitter in the huge eyes as they bent downward.

"I am now Jim Wentworth, one of those hyper-universe creatures who unaccountably appeared in the void close to the triple sun, clinging precariously to a small fragment of world," he heard himself answer readily. "Before that, I, one of Arimuz, had no name."

The great Kam glowered down at the speck of Jim Wentworth. "You have loitered on the way," he said. "Your fellows were here long before this—both those who were successful in finding bodily forms, and those who failed, and have returned to their vegetative baths, waiting for further opportunity to conquer the active state. Why are you, of them all, so late?"

Jim's occupant explained, even as he had explained to the black dwarf at the gate of Orimuz. But Kam was not so readily satisfied. "It is passing strange." His thought beat like hammer blows in Jim's circumscribed mind. "Aldahor has escaped. It was forewarned. Yet how was it possible? Our plans were laid in utmost secrecy; our foray upon the triple suns was faster than the light that carried news of our approach. By now, all the life-bordering men of Orimuz should have been clothed in the stolen forms of Aldahor—forms that rightfully belonged to us uncounted æons ago—and stirred to active, sentient being, even as these who surround me. The hated world of Aldahor would have been irrevocably destroyed, and Orimuz would once more have assumed her rightful overlordship of the universe."

The six who ringed him round shifted

their misted iridescence, and wove approving thoughts.

"Instead," Kam pursued, "Aldahor received warning, and has fled, while a poor few of you have to be content with these puny, insufficient forms of low-scaled creatures from another space. Who, then, was the traitor?"

Jim Wentworth bowed with restrained humbleness. "I would not know of these subtle things, O Kam," he heard his mouth form hissing speech. "I was but recently awakened from my cup of formless thought, and am but newly activated with this form which you have truly designated as low-scaled."

Kam stared down from his tremendous height, probing, wary. Slowly, the swirling fog of spaced molecules regained its pristine glow. He leaned back, waved a giant, tenuous hand. "For the moment I had thought—" He then retracted the emanations of his mind. "Get you into the preparing chamber with your fellows, you who are now called Jim Wentworth—a barbarous name."

Jim bowed again, and moved with dignified motion over the gleaming red floor. But it seemed to the imprisoned Earthman that Kam had not withdrawn his thought in time. He heard, or seemed to have heard, a whispered name. "*Insar!*"

INSAR! Why should Kam, the mighty one of Orimuz, have thought of him? Insar, who had claimed to be an exile from this universe in the familiar hyper-universe of Earth and the galaxies, who had seized on Matthew Draper's form to gain Earth life, and labored desperately to regain this weird interior universe to avert some terrible, impending doom; who, nevertheless, his purpose accomplished, had yielded voluntarily the no-longer-useful body to its rightful owners? *Who then was Insar, and where was he now?*

Then that, too, was forgotten.

He had already, with effortless ease, traversed the vast spaciousness of the tower. A violet beam guided him on the way. Behind, somehow, he sensed the still-inquiring thought of Kam surging after him, trying to probe inward into the intelligence that surrounded him. And, somehow, he knew, as well, that the entity had sheathed himself against the prying emanations.

Two dwarfs of Sirius lounged their incredible weights before a vaulted arch. They stared up at him with malign laughter in their solitary eyes.

The chamber was smaller than the great inner hall, but still of spacious vastness. A pale-violet glow quivered lambently over its occupants. The light emanated from a central column of flame that sprang sheer and cylindrical from a bottomless pit in the dark-red floor, and soared interminably to the topmost reaches of the tower. It seethed with inner turbulence, but its rounded surface was smooth with pulsing color. It flamed, but there was no heat. It was light; yet it was not light. It consisted of emanations unknown to Earth, emerging from the innermost bowels of Oriuz. It was beautiful with an eerie splendor; yet Jim—entity and Earthman alike—shrank from its flowerlike glory as from something indescribably malign.

None of the other Earthmen or women in the chamber seemed to be afraid of the shining column. They walked unconcernedly close to its shimmering round, disclosing, even, by their movements, an eagerness, restrained for the moment, an impatience to thrust themselves into the pulsing glow, to bathe in its vibratory radiance.

There they were—all of them—the ravished people of Earth. They turned at the advent of the newcomer. Hissing words of greeting issued from their mouths. Jim recognized them all.

Here, to one side, was Dudley Nich-

ols, the slight, wizened mine president whom Jim had last seen running and stumbling and choking with terror in the grip of an Orimuzian ooze; over there was Ben Hinkman, thickset farmer broad of face and speech. Others shifted into his vision—youthful elegants, male and female, of the Harbor House; horny-handed down-East natives; garagemen; waiters in tattered jackets; men with gnarled hands and weather-twisted countenances; women with smooth, lifted faces and diamonds still glittering on their once carefully manicured fingers; little children in faded overalls; others in expensive English importations.

In short, all the strange conglomerate that had been reft from one universe and catapulted into another through the stumbling intervention of Jim Wentworth.

He recognized them all, and passed them by. He was seeking desperately, through eyes that focused under an alien influence, for two persons: Matthew Draper and Claire Gray—especially the latter.

HE SAW the scientist first. He was staring avidly into the pillar of fire, and had not even turned at the arrival of his former assistant. Jim could not see his eyes; the man's back was turned half away from him.

As Jim moved toward the knot of colonists, his pace slowed, dragging, reluctant. He tried to will himself forward—and moved even more slowly. He must find Claire. Then, as though his occupant finally realized his urgent thought, his eyes swerved to the right. Jim's detached entity pulsed eagerly, subsided with a shocked despair.

He had seen her! And she was staring straight at him! But what had happened?

The girl's beauty had not changed. In fact, she was more breath-takingly beautiful than ever before. Her charms,

hitherto modestly concealed, were now semibare for all to behold. Jim Wentworth himself had been responsible for this. Back on the Earth fragment, during the swift invasion of Orimuzians, he had tried to rescue Claire from the interpenetration of a life-avid entity. He had failed; but, as she had hurtled aloft, the grip of his clutching fingers had ripped the sheer material of her dress. It hung on her now, torn, desecrated, betraying the loveliness beneath.

Yet Claire Gray made no attempt to cover her seminudity with the tattered remnants of her clothes; instead, she was staring boldly at her fellows. It was her eyes that forced a soundless groan from the restricted consciousness of Jim. They were the eyes of Claire in color and shape and texture. But the spirit behind the hazel limpidity, the light that had once revealed her soul, were gone. In their place were coldness, calculation, malicious triumph—everything that had been foreign to the girl with whom Jim had worked on Earth and in Infra-Universe.

She moved toward him. A smile, half mockery, half invitation, wreathed her features.

"No! No!" he cried out soundlessly, in helpless anguish. He had yearned to take her in his arms—but not this way. Not in such a shameless condition; not with that smirk on her lips and strange invitation in her eyes.

He tried to recoil his body, could not. He was a frozen prisoner, compelled to stand and await the oncoming of this travesty of the girl he now knew he loved. For with the shame and degradation had come bitter realization. It was not Claire who was doing this—but the Orimuzian incubus, forcing her forward, seeking amusement and malicious satisfaction from the tumbled memories he was evoking.

She was speaking to him, in the language of Earth, with lips that were hers, and yet not hers. Or rather, to the be-

ing who had taken possession of him. "Welcome, one of Orimuz! I have been waiting for your appearance. The creature in whom I am clad has thought of you often and long. There seems to have been a strange connection between us on that inferior planet known as Earth. Love—she called it—though I had to drag the name out of her unwilling memories. Love!" She laughed at that, brutally, shamelessly. "I think we two ought to probe the mysteries of this queer sensation. Come!"

Her arms went out in voluptuous gesture. The remnants of her dress fell farther away. Jim shrank himself in a nausea of shame and degradation.

She came closer. He felt the warm incense of her breath, saw the glitter in her eyes. Then, quietly, easily, the body of Jim Wentworth stepped aside. "I am not interested in the primitive sports of these people whose forms we have adopted," he said coldly. "We require the latter for active life, but the former would only becloud the pure flame of our own mightier intellects."

Claire laughed, but her eyes were icy. Something lurked in their depths. Yet she stopped short, and turned away with shrugging shoulders.

Jim breathed again; the choking nightmare slowly lifted. In its place was a flooding gratitude for his entity, the first emotion other than helpless anger he had felt for him. His thanks surged out, were swiftly thrust back. An almost audible "S-s-sh!" whispered in his consciousness.

For a mighty thought was blasting at their minds—the thought of Kam! "It is time to enter the bath of preparation," he decreed. "We are fast overtaking the cowardly orb of Aldahor. There is no question as to the outcome. Aldahor will be eradicated from the universe, her godlike forms transferred to the waiting essences of Orimuz, and the traitorous Aldahorians exiled to the hyper-

universe to exercise their talents." Kam's thought grew gray with anger.

"This time there will be no slip-up, as in the case of the false Insar. The flaw in the projection machine has been discovered, and repaired. They shall dissociate into a million fragments, so infinitesimal and so wide-scattered that not even their intelligences will ever be able to reassociate them."

Jim hearkened in a chaos of turbulent emotion. His earlier wild surmise had been correct. The ultra-viruses of Earth, harbinger of infinite suffering, were then the smashed fragments of beings from this universe! Because it was their only method of achieving active life, they brought death and desolation to the inhabitants of their place of exile. Not all of them, it was true. For some —know as bacteriophages to me—by a freak of chance attacked only the pathogenic bacteria, and thereby aided their unwitting hosts in the endless struggle against disease.

JIM REELED in a circle of circumscribed agony. If Aldahor were conquered, and the threats of Kam put into effect, there would be unleashed upon a helpless Earth, and upon the other inhabited planets of his universe, such a horde of swarming ultraviruses as must sweep all life away in one great, devastating plague!

All the laborious evolution of man, all the similar evolutions of the unknown beings of other planets, would be lost to eternity. Matter would remain; but thought, the motivating impulse, would vanish as if it had never been. Even the destroying viruses, left without the quickening means of organized life, would return to their original state of unsentient immobility—frozen forms not far removed from the crystals.

Through a haze, he heard Kam continuing. "It is necessary, before we reach Aldahor, that you fuse irremovably in the bath of preparation the

bodies you have adopted and your own formless essences. So that, in the fury of combat, you may not be wrenched apart; and that there be no cause for quarrels here on Orimuz between the various forms, as there once was in the past. Such is my will!"

The captured Earth people bowed humble acquiescence to the invisible master. All, that is, except Jim Wentworth. He stood a little to one side, straight and proud, hands clenched at his sides. Jim wondered at himself. His detached brain tried in vain to pierce the sentience of the invading intellect. Queer, incredible thoughts whirled round and round.

Already a man had stepped forward. He was young and dark-haired, a banker's son on Earth, who had won the golf championship at Harbor House. He moved eagerly toward the seductive cylinder of flame, as to a tryst with one dearly beloved.

Jim cried out involuntarily: "For Heaven's sake, Horton, don't go!" To his surprise the cry echoed from his lips in the language of Earth.

But young Charlie Horton did not hear, or, hearing, paid no heed. He plunged into the fiery bath, hung momentarily suspended within the pulsing vibration, shimmered in lambent fusion, and stepped out on the other side. Charlie Horton was no more—the separateness of his being had merged irrevocably into the entity of Orimuz.

Jim felt sick with horror. One after the other his fellow beings were streaming into the malign radiation; one after the other they fused beyond redemption into the alienness of Infra-Universe! Always they must remain shells of Earth, slaves to their infused masters, never even to have the poor consolation of their own helpless thoughts.

They crowded and jostled, waiting their chance. The ranks thinned. Jim struggled desperately at invisible bonds. If only, somehow, he could burst

through his engulfing captor, thrust them away, beat them back with smashing fists. But he remained motionless. He had managed to break through with one unaccountable outcry; after that, the mesh of restraint had choked him down.

A bare fifty remained of all his comrades; only fifty on this side of the perilous bath. The others had received the fiery unction, had vanished to the rear.

CLAIRE! Draper! Jim sought them in deep anguish, through will-less eyes. Draper was waiting his turn, his body quivering with eagerness. Only a little knot was before him, swinging into the glow two by two, in unison. The knot melted rapidly away. Soon it would be his turn. Heaven alone knew with what inner thoughts the hapless, interpenetrated scientist awaited the approaching annihilation of his identity!

Jim was suddenly aware of the calculating gaze of Claire Gray. She, too, stood a little to one side, watching him through half-veiled lids. Simultaneously, his own muscles relaxed. A glimpse of almost fear beat within him, clamped down to smooth blankness. What did it mean?

Claire parted her tender lips. Incongruous mockery issued forth. "I see, one of Orimuz, how impatiently you await the bath of preparation. You are anxious to be rid of the troubling identity of Jim Wentworth. I do not blame you. The silly little mind of Claire Gray flutters around within me, struggling futilely against my superior intelligence."

She glanced down at the graceful contours of her rounded body, laughed. "These petty Earth things seem actually ashamed of their own forms. Queer, isn't it?" Deliberately, the girl ripped more of the tattered dress, revealed more and more of glowing charms.

Jim Wentworth said nothing, nor did

he make any move. But the real Jim plumbèd the depths of wildest shame and humiliation for the girl he loved.

Her long lashes lifted, probed Jim Wentworth. "You are so impatient," she said. "It is not fit that you wait your turn. I am certain our fellows will yield their place in your behalf. Go, one of Orimuz, into the fire that makes you unity."

A new note had crept into Claire's voice, commanding, sinister. Obviously, the Orimuzian was one of Kam's lieutenants—a spy, perhaps, upon his comrades.

Jim tensed his inclosed mind against the bitterness of final dissolution. Soon it would be over, and he, young, avid for life, would be no more.

But the body of Jim Wentworth made no movement. The muscles tensed stealthily.

"Why do you wait?" Claire demanded harshly. Suspicion flared in her narrowing eyes. "Know that I am Lel, instructed by the mighty one himself. Do not disobey, you who have clad yourself in the form of Jim Wentworth."

A wave of inbeating hate and fury lashed over Jim. But the outer round was smooth, emotionless. "I but wait my turn," he said aloud, calmly. "Claire Gray goes first into the purifying flame. Which is right and proper. On Earth, from which our bodies have stemmed, the gentleman always yields the post of honor to the lady. You, O Lel, are now that lady."

Something split and sundered in Jim's mind. Little fragments of a jumbled puzzle clicked into place. All the strange actions of himself, the subtle differences. His blinding revelation smote out involuntarily, calling out a name!

At the same time Claire—the real Claire—burst the bonds of her enveloping degradation, rose to the heights of intuition. She, too, cried out a name!

THE NAME leaped from her virgin thought, impacted on neurone tracks, switched open memory synapses, flooded the whelming intelligence of Lel. The body of Claire Gray stumbled back a rod; her mouth sagged open; a dread name issued.

"Insar!"

Insar, chief of Aldahor, who had been caught unawares by an overwhelming force of the beings of Orimuz and dispossessed violently from his godlike form! Insar, who should have been exiled in a million, million irrecoverable fragments into the strange outer universe, never to return! Insar, unaccountably back again, even more unaccountably in possession of one of the Earth bodies—a spy in their midst!

Lel repeated the name in quick alarm. Of all the beings of Aldahor, only Insar, their chief, was to be feared. Even Kam himself—

At the dread sound of that name the dwindling few before the shining rush of flame whirled, gaped wide. "Insar! Insar!" The name leaped from tongue to tongue, murmuring at first, swelling into a scream of hate and fear.

Outside the archway, the dwarf guards heard, and hissing syllables spilled excitedly from thick, swart lips. The name ran like a a fiery spark along a train of gunpowder down the endless outer hall. The tiny Sirians paused from their labors, dropped their overwhelming loads, took up the cry.

The din increased, rising in a crescendo of hisses and barking shouts as it sped faster and faster toward the central throne of the mighty one and his surrounding council.

The lesser ones started in their seats; their shimmering nebulosities quivered in dun fear. Kam, towering like a colossus on his throne, heard the tumult and the shouting, and jerked upright. His vast form filled the great inner chamber with its tremendous presence. The rainbow iridescence of his wide-

spaced molecules paled, then burst into a flare of angry colors.

His thought swept out with the speed of light—a physical, roaring wave. It ripped into the cowering consciousnesses of the black dwarfs from Sirius; it slammed into the entities of the people of Earth; it brought his surrounding fellows to their feet.

"Get the traitor, Insar!" it screamed. "Seize him, ones of Orimuz. This time he must not escape; this time he shall catapult to shattering ruin."

The black monsters heard and wheeled in obedience. The hyperbolic mirrors glowed green on their breasts. A single spasm, and paralyzing waves would flow over the focused victim in their paths.

They ran, hissing and chattering, toward the inner chamber of the bath of preparation. Within, the entities of Orimuz heard the mighty one's command. Dread of the master overcame the dread of Insar. Lel darted forward, a white flash of graceful limbs peeping through the swirling remnants of Earth garments. The others sprang after her, their faces inflamed with the chase, twisted into alien cruelties. Matthew Draper was their leader!

Insar—Jim Wentworth—released his tense muscles. He swept swiftly to one side, moved in a single flowing motion toward the entrance arch. Tiny monsters blocked escape, Cyclopean eyes baleful in Stygian bodies. The mirrors of paralysis glowed, flashed toward him. He swung back in a smooth rush. The ones of Orimuz, in their Earth shells, shouted triumphantly, whirled for him.

Insar poised a fractional instant; then, without hesitation, darted straight for the bath of preparation!

Jim writhed, struggled unavailingly. That way lay annihilation for himself, if not for Insar. But the latter paid no heed to his futile will. Into the glowing, pulsing emanations, whose source was the mysterious interior of Orimuz,

he sprang. A shout of exultation followed him. Then a cry of terror. For Insar dropped unhesitatingly into the vent, vanished out of sight into the dim, forbidden hollow of the planet. The pursuers drew back in fear, ran blindly for the gateway to report to Kam. Thereby they blocked the influx of the dwarfs, who alone knew the secrets of the depths, who alone might have followed Insar in his desperate flight.

## VI.

JIM felt a heat that was not of Earth, heard a soft roaring that ran through swift diapasons of sound. His body glowed in a shimmering dance of atoms. A fusing radiance flowed in and over him.

Then he was dropping down, down, through an upward blast of emanations. Insar swerved Jim Wentworth's body in swift acceleration. A cold, light-quenching green, like that of an overcast sea, enveloped them. The plucking, relentless pressure ceased. The edges of identity trembled, tried to pull apart. He had burst through the fiery bath of preparation, was lunging meteorlike through the hollow round of Orimuz.

Jim shuddered with the swift reprieve. His death-shadowed mind stirred unbelievably, slowly oriented itself. But the edges resisted his identity; there he was neither Jim Wentworth, nor yet Insar. There had been partial fusion in that blinding instant of the bath.

He looked about him with the wary glances that Insar cast. Now was no time for ejaculations, for inquiry. The two-in-one of them must find shelter somewhere, somehow, before the inevitable pack got on his heels.

The dim interior of Orimuz was even stranger than the outer surface of this alien world. Through a hundred openings in the smooth, concave crust that led directly into the great tower of Kam, the dwarfs streamed in endless files.

Each was weighted down under a top-heavy load of jagged, dark-glowing substance.

Down into the interior they dropped with their packs, down toward the very center of the hollow orb. Up they soared again, packless, obviously to reload, and return. Since matter in the Infra-Universe did not warp its surrounding space into gravitational world lines, there was really no up or down, except as Jim's Earth-habituated mind superimposed such concepts on a featureless space. Hence the ease of locomotion.

Insar skirted the unheeding dwarfs warily. Jim's bodily eyes clung in fascination to a central glow. It was a ball of bright-green fire, expanding and contracting in rapid, regular impulses. As it flared outward, tubes of vitreous material snaking from its pulsing core to the sphere crust of the planet, like spokes of a wheel, pumped bright-green fire upward.

The hum of invisible machinery rose in volume, died again with contraction. The continual dumps of metal were evidently fuel to keep the central sun alive; the ball of green flame itself was just as obviously the motor power that drove Orimuz on its hurtling path, suffused the planet with its sinister glow.

But one of the translucent tubes did not extend with its fellows to the surface. Instead, it angled out a short distance, buried itself in a gourd-shaped machine. From the mouth of this machine a column of iridescent flame leaped upward, shining with unholy beauty, to pass effortlessly through an orifice in the crust, and be lost to view.

With a shock, Jim realized what it was: the bath of preparation, through which he had just escaped! But his eyes, uncontrolled by him, were fastened with a kind of flaming eagerness upon the central pulsation—not on the sheer cylinder of lambent blaze. He was two

alien intelligences, each with a different objective.

But there was no time for such precarious speculations now. For the outer turmoil that attended Insar's flight had reached the toiling inmates of the depths. The swarthy beings from Sirius hissed excitedly, hastened to drop their burdens into the central fire. Guards with hyperbolic reflectors sinister on their chests came pouring in through the vents, seeking their prey.

DESPERATELY, Jim searched for a hiding place. The huge interior seemed horribly bare of nooks and crannies. Sooner or later he must be discovered. Only the dark sea-green of the inner space held his dodging, swift-swerving form from instant disclosure. And the violet pursuit beams were already crisscrossing the gloom in a spraying network of betraying rays.

Silently, stealthily, Jim clung to the inner round, seeking to keep out of the way of the searchers. But it was a game of hide and seek that could have only one ending: discovery—irrevocable exile for Insar—more irrevocable annihilation for Jim Wentworth.

His body sprang suddenly. Jim was taken by surprise. What was Insar up to? But the being of Aldahor gave no inkling of his plan. Like a plummet, he dropped, accelerating to breath-taking speed, straight for the central globe of pulsing green.

Jim cried out, tried to swerve his crashing body from its insane course. He might as well have tried to stop a rushing locomotive with bare, back-thrusting hands. Insar had determined on a suicidal course.

Jim saw it all in a flash. If, by the momentum of their crash, Insar could jar the mechanism of the directive power supply into even temporary uselessness, his fleeing homeland of Aldahor would make good its escape. Even in his shattering fear, Jim could not restrain a

burst of admiration for the patriotic sacrifice of his other personality.

Then he smiled grimly to himself. Insar was immortal, indestructible. At most, a dissociated exile would be his lot when captured by the raging Orimuzians. But he, Jim Wentworth, man of Earth, would meet with instant death, cessation of being. And there was Claire somewhere above!

The black dwarfs clustered round the central blaze heard the screech of his passage. They whirled in alarm, saw the hurtling body, tried vainly to get out of the way of the smashing thunderbolt, twisted to bring their mirrors of paralysis to bear.

Then Jim Wentworth was upon them. His hands reached out, gripped a hissing dwarf. A giantload of jagged ore weighted him down. The sudden, decelerating wrench swung the struggling, screeching wretch in a whirling arc, almost tore Jim's arms out of their sockets. These fused compacts of monsters of Sirius and ooze of Orimuz were incredibly heavy; and the ore itself was no mean mass. Weight, of course, in the Earth sense, was absent, since there was no gravitation; but mass, momentum and inertia still held their fundamental qualities.

Jim knew now exactly what Insar intended. He bided his time with a grim intensity. The vast interior of Orimuz was a screeching, seething pandemonium of tiny dwarfs. The luckless captive was an incredible swinging arc. Reflectors flashed toward them, but the paralytic beam would be too late. Insar concentrated all his supermind on the task before him.

Jim's arm lashed out, let go its squalling load. Dwarf and metal fuel hurtled forward. But in that last instant between retracted muscles and forward thrust, Jim Wentworth himself had acted. He summoned all the concentration, all the gritting will at his disposal, in that single act of volition. Insar's

own absorption, the semifused edging that overlapped their entities, assisted. Jim's scheme worked!

The living missile hurtled forward—but not in the line of flight that Insar had anticipated. It swerved slightly from the true. Instead of catapulting directly into the baleful orb of green that motored Orimuz, it went smashing and crashing into the gourd-shaped machine that powered the bath of preparation. There was a rending sound, a shattering of metal. A blinding, blasting explosion rent the glowing column apart, caught Jim's body in its outward rush, sent it tossing and tumbling in insane flight. The interior of Orimuz was a hell of flame and sound and hurtling bodies.

JIM GRINNED HAPPILY. Now nothing mattered. Let death come! He had saved Claire and Draper and the pitiful few who had not yet entered the bath of preparation, from a horrible future of complete submergence.

Insar pressed furiously in upon him, smothering him with the beat of his wrath. "You've ruined my plans!" he blazed. "I would have saved Aldahor from Kam and his accursed cohorts. Now all is lost. I'll never get the chance again."

Jim fought back against the unendurable pressure. "I am not sorry," he retorted defiantly. "I, too, have had my plans. I have succeeded. I have saved Claire and the others of my kind from a fate that was horrible beyond conception. Death itself is welcome compared to what was pending. What happened to us did not matter to you; I, too, therefore, had to think only of my own."

Insar was suddenly silent. His wrath ebbed. His thought even glowed with semiadmiration. "If Matthew Draper and you, Jim Wentworth," he said finally, "are fair examples of Earth's people, there are possibilities in them,

primitive and limited in intelligence though they be. But the ones of Orimuz are after us," he said, "and this time there will be no getting away."

The blast had spent itself. The green orb pulsed as before; the translucent tubes glowed with force emanations, Orimuz whined with the speed of its pursuit across an unending universe; only the shimmering column of violet light was gone. Already the scattered hordes of Sirians were screeching their cries for vengeance; already the search beams crisscrossed the void to pick up the trail of Insar.

"There is still a chance," said Jim quietly. "It is probable that Kam has gone to the preparing chamber to discover what damage has been done. And, if I read his character aright, his subsidiary ones will trail along, appendages to his mightiness. That means the great tower itself is empty, except possibly for the little black monsters. We may be able to avoid them, get out somehow to the surface. Then——"

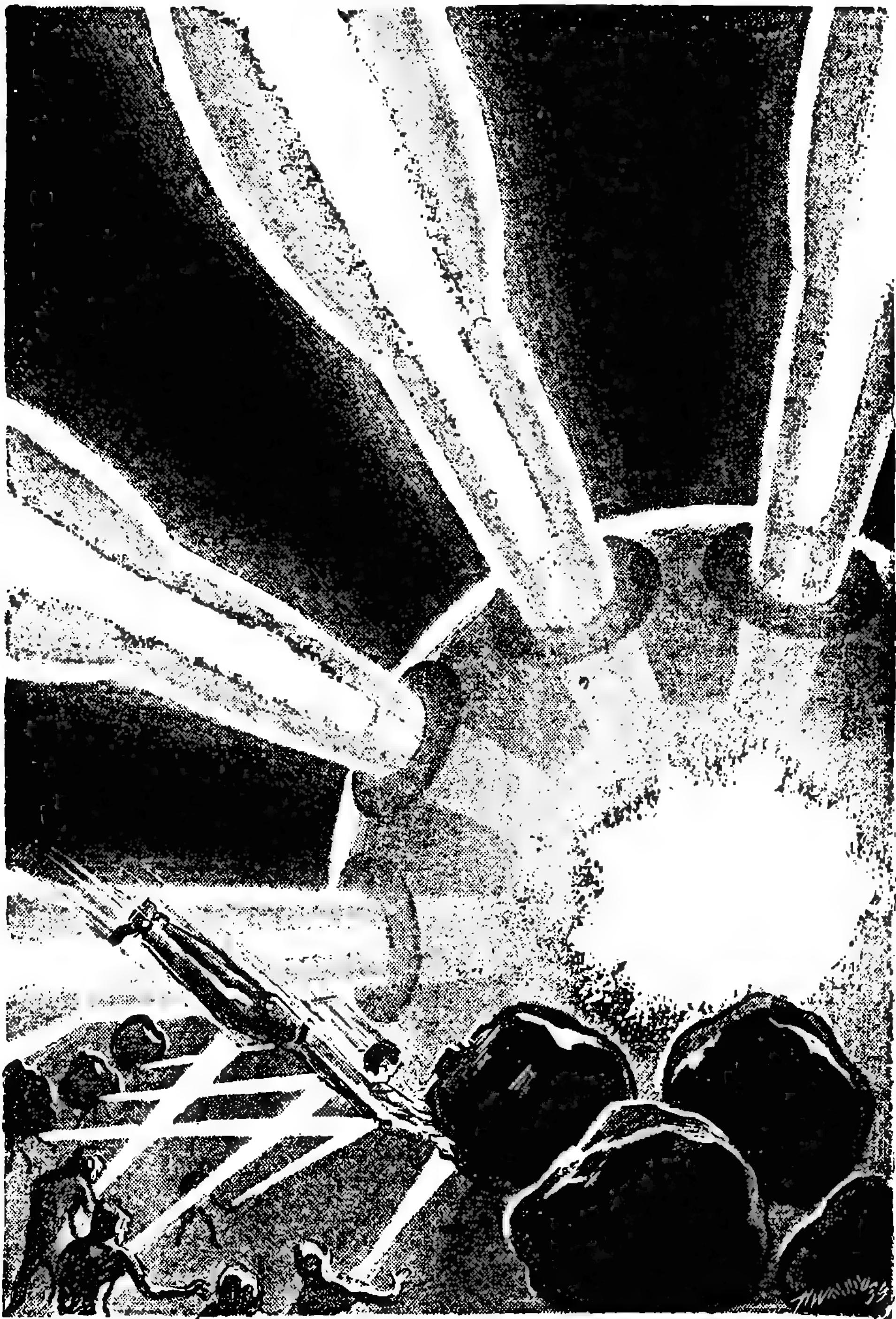
Insar was a being of swift decisions, even as Jim Wentworth. "You are right," he interrupted, and translated thought into instantaneous movement. He doubled on his tracks, shot upward like a bullet from a high-powered rifle.

A round orifice loomed ahead. He shot toward it. Luckily, no dwarf blocked his path. All the tiny guards were either within the hollow interior, joining the hue and cry, or outside the tower. At least, that was the only basis for Jim's desperate attempt.

He flung out into the great inner chamber of the mighty tower. It was empty. Jim's surmise had been correct. The mile-high throne and its satellite seats loomed silent and vacant.

"Swell!" Jim exclaimed. "Now if you can get to that entrance wall, find the combination to make it open, and then——"

Insar said: "Look! It's too late!"



*Then the body of Jim Wentworth sprang! Weight, of course—in the Earth sense—was absent—but mass—*

PALE-VIOLET BEAMS swung from the far-distant wall with seeking fingers. The guards were warned, alert. Jim turned his head. The peaked arch to the preparing chamber blurred. Misty figures, like thick fog, were coming through.

"Kam and the subsidiary ones!" Jim exclaimed. "Returning!"

"Yes. They'll be here soon."

"But they are small now, a tenth of their former size."

"Only to be able to get through the doorway," replied Insar. "Watch—they'll grow back to normal now. It's a compressive property possible to the tenuous Aldahorian forms."

"What shall we do now? We seem trapped."

Already Kam was looming in the distance, expanding into giant vastness, coming on with swift angry strides. Insar did not hesitate. He cleaved the dun expanse, rushing aloft like a rocket projectile. It was touch and go. If Kam had seen him; if the search beams had contacted his swift-rising form—

But there was no cry of discovery, no green swath of paralyzing rays. Temporarily, he was safe. Up and up, Jim hurtled, mile on mile. There seemed no end to the tower.

Then Insar braked acceleration. He had reached the top. He swung Jim's body up to a platform of glassy green, suspended beneath a dome of paler hue. An observation platform. The dome was transparent and gave view on infinity itself. From below, the hiss of unremitting search beat faintly up at him.

Jim's consciousness had noticed a subtle change in the relationship between himself and Insar ever since the plunge into the bath of preparation. He was no longer submerged, no longer a helpless entity. The slight fusion of identities at the edges had given him roots again, made him more nearly equal to the mightier, dominant Insar.

A channel of free communication had formed.

Now both were staring out of his eyes at cerise infinity.

Orimuz lay far beneath, countersunk under the swelling bubble of glittering yellow. The slender cups, like inverted mushrooms, in which lay the structureless ones of Orimuz, awaiting contact with life forms to come to quivering activity, were dots of poisonous green. The triple sun, flashing with kaleidoscopic colors, was nowhere in sight, lost in the void.

But straight ahead, silhouetted against a back drop of infinity, glowed another sphere. A silver world, shiny and lustrous, flashing with studded knobs of diamond brilliance—Aldahor!

Jim groaned, or rather, it was Insar who gave vent to his despair. "Aldahor is doomed," he lamented. "Its flight has been in vain. Orimuz is speedier by far. There is no shelter anywhere in all the universe."

"Can't your comrades fight?" Jim demanded.

"Fight?" echoed Insar dully. "With what? We are a peaceful race, bent on contemplation rather than activity. Orimuz has weapons such as we never thought to build. See! They are trying them out already."

Green flashes stabbed out from the surface beneath, ripped through the void for millions of Earth miles. They fell short of their prey, but by perilously small margins. It would not take long for the pursuing world to bring Aldahor within range.

"Those flashes," explained Insar bitterly, "are gigantic paralyzing waves. All matter, all thought, stop in their tracks while the ray is upon them. The world of Aldahor will become a motionless rigidity in the envelopment of the rays, a fixture in space. My people will lose all thought, all power of locomotion, all resistance. It will then be a simple matter for the triumphant ones

of Orimuz to dispossess us from our bodily forms, to insert instead the waiting hordes of their own kind.

"Since our thought-matter content is essentially indestructible, we shall all be thrust out into your alien universe, shattered by their diabolical machines, so that our million million dissociated entities will be helpless, powerless to return. Already some half dozen of my people are ruinous dissociants in your world. Ultra-viruses, you call them. They destroy your people because they cannot help it; because their tiny blobs are barely sentient, seeking rebirth, and finding only multiplication of destructive possibiliites. You may understand," he ended quietly, "what will happen when all Aldahor is thrust similarly into your space time."

JIM UNDERSTOOD, had already weighed the future. But now that the deadly fruition seemed veritably at hand, he was appalled. "You must fight!" he cried desperately. "There must be a way out."

"We shall fight, of course," Insar said grimly. "But it will do no good. We have no weapons!"

"Were not your bodies fused with yourselves, as with the Orimuzians?" Jim insisted.

"No. We did not believe in the annihilation of the entities of our hosts. The arrangement is what on Earth you call symbiosis—a mutual interweaving of parts, a give-and-take arrangement that is highly profitable to both members of the dual entity. You see," he explained, "Orimuz was once the sole world in all Infra-Universe. It revolved around the triple sun in solitary majesty. All life consisted of the structureless fusion of matter and thought as in the waiting ones of Orimuz, and as you found me in my temporary exile."

"And then the superheavy dwarfs of Sirius broke into this universe?" queried Jim.

"I didn't tell you," answered Insar. "There was an earlier invasion—if you could call it that. They came from Betelgeuse, the giant star of your galaxy. They had dwelt on the surface of the Sun itself, giant inhabitants, misty, tenuous vacuums on a star that itself was but a glorified vacuum of heat and light.

An explosion took place in the interior of the bubble star. The force of the explosion, the fierce storm of outward-thrusting radiation, pried the atoms and molecules of the Betelgeusans still farther apart, beyond even the best vacuum Mathew Draper could have manufactured on Earth. Gravitational pull weakened to the vanishing point; the space warp, during the tremendous expansion, flattened out and vanished with it. As a result, they became dissociated from their own universe, found themselves suddenly within our Infra-Universe."

Jim's throat constricted; his eyes still stared across the fast-narrowing space of Aldahor. "They made their way to Orimuz, unwittingly contacted the lifeless-seeming ones that were ourselves," Insar went on. "Life forms are catalytic to us—activate us with incredible rapidity. We took possession. At first they struggled, unavailingly; then mutual respect grew. Their intelligences were equal to our own; we each possessed knowledge, capacities, not granted to the other. The symbiosis was mutually helpful, and became a voluntary act. We lived in amity, have continued to do so ever since."

"But how about the black dwarfs of Sirius?" Jim interrupted.

"I'm coming to them. From their irruption into Infra-Universe dates all disaster. We didn't realize it at first. We welcomed them, infused our life-bordering breathren into their monstrous little bodies. But something happened. The race of Sirius was as twisted in its mind as in its body. The symbiosis was demoralizing. Their evil intelligences poi-

soned the thought wells of our brethren, warped them to their own ends. As a result, two fast-differentiating races inhabited Orimuz. It could not continue.

"We, the inheritors of Betelgeuse, voluntarily withdrew, and builded a beautiful new world which we called Aldahor. There we thought to live in peace and quiet contemplation. The dwarfs of Sirius hated the light and glow of the triple sun, and took their planet out into the timeless void. There they busied themselves with strange new forces, weapons of destruction. They resented our shining forms, our giant size. Through the æons the envy grew. A few of our wide-wandering comrades were caught unawares, stripped of their forms, expelled to alien space. Among them was the chief of Aldahor."

"Yourself?"

"Myself," Insar repeated with dignity. "Kam, one of the dwarfs, clothed himself in my shape. Because of superior cunning, because of the unwilling aid my Betelgeusan entity could furnish, inhibited from rebellion by a small dosage of the paralyzing beam, he was soon able to gain control of Orimuz. It is his plan to capture Aldahor, to clothe his fellow Sirians in our shining garments, to thrust the old puny husks on the still-lifeless ones, and rule the universe entire. That was the reason he wished to merge your Earth entities with the newly wakened ones. They might, in turn, strive to do unto him and his dwarf intelligences as they are on the verge of doing to us."

INSAR PAUSED; there was silence. The distance between the two worlds was rapidly diminishing. The stabs of green flame jutted closer and closer to the fleeing planet. It was but a matter of minutes, now.

"We'll have to do something," Jim said violently.

"I intend to," Insar agreed quietly. Yet he seemed to make no move.

"What's happening?" Jim cried suddenly. There had been a faint, ripping sound, as of something tearing loose. There was no answer. Instead, he felt as if a nightmare weight were slowly being lifted. His ego expanded, swelled with a blessed sense of release. His mind breathed freely once again, took hold with firm roots on memory synapses, on nerve and muscle controls. He willed, and his arm lifted in responsive obedience.

In his first bewilderment, Jim did not realize exactly what was taking place. Then his eyes dropped to his body, and he staggered back with a cry, half of loathing, half of fear. From every pore, from every interstice, a viscous, structureless mass was oozing. Insar was voluntarily quitting his Earth host, cutting himself off from active thought and motion!

With a supreme effort Jim overcame his first repulsion. "Here, don't do that!" he exclaimed to the Aldahorian. "You're losing your last chance to do anything for yourself, for your race. With my body, perhaps—"

Insar's retreating thought ebbed around his expanding intelligence. "I am returning to Aldahor. It is the only way. Alone, I have a chance to avoid the search beams of Orimuz. With your solid, clumsy form we'd be cut down in the void before we reached halfway. I have sufficient activation to last until I make the silver planet. There my comrades will furnish me with one of their own forms. Perhaps I may be able to help—who knows! Good-by, Jim Wentworth, good luck!"

The ooze was forming a transparent mass in the tapering dome. It quivered like a jelly. The last thin thread snapped off. Contact between Earthman and Insar of Aldahor was broken.

"Come back!" Jim urged desperately. Now that the moment had arrived for which he had prayed this long, weary while, he was afraid. Afraid for Insar,

for Aldahor, for his Earth companions down below, still bound to brutal entities, for himself.

But only a sibilant hiss was the response. No thought surged within him. There was no further bond of communication.

Insar vibrated rapidly. Then, suddenly, he was gone, piercing the green transparency of the dome as though it were a mere illusion.

## VII.

JIM TURNED SLOWLY. It took time for full awareness to come to him. He was a free agent again—Jim Wentworth, himself! He flexed his arms, shifted his legs, breathed deeply. Everything moved as he willed. A sense of power flooded his being, subsided as rapidly as it had arisen. His position was more desperate than ever. Before, he had Insar's mighty intelligence to rely on, but now—What could he, a mere Earthman, do against the sinister ones of Oriuz, headed by the mighty one himself?

He peered down. The search was still going on. The violet rays were an impenetrable network, lifting slowly, higher and higher. Soon they must reach the platform on which he had found temporary safety. He laughed grimly. He would be incontinently hauled down, interpenetrated with a waiting one, eventually to join his fellows in a new-constructed bath of preparation.

A faint, hissing cry sprang up at him, grew in volume to a great, tower-vibrating shout. The platform swayed precariously. He almost lost his balance. He peered down into the depths in alarm. Had they discovered his whereabouts? Were they even now rising swiftly to get him?

But the web of interlacing beams had not raised. Rather, they had dropped to the ground, were flicking off as if the

search had been abandoned. Jim's forehead crinkled in a frown. What was up?

Something made him turn. An Earth curse swept his lips. He knew now what that pæan of triumph had portended. The pirate planet had caught up with its prey!

Across a no-longer cerise void the green flames lapped out with avid eagerness. Swords of doom extended across infinity. Their tips quivered with obscene fires around the silvery disk of Aldahor, farther and farther, wrapping it round in inextricable embrace.

Jim Wentworth shivered. He was witnessing the doom of a mighty planet, of a mighty race. Insar had arrived too late, would be caught in the fate of his fellows. Back in the hyper-universe of Jim's own kind, the repercussions of this strange, other-universe struggle would be incredibly disastrous.

Jim ground his teeth in helpless desperation. Then his jaw slowly hardened; a grim light sprang into his eyes. He would not be caught like a rat in a trap, waiting here, cowering against inevitable discovery. No matter what the overwhelming odds, it was his duty to fight on to the end.

FOR A WHILE he thought, quietly, intensely. He did not turn his head, refused to glance back at what was taking place on Aldahor. He did not wish to see. Then he grinned, and when Jim Wentworth grinned, he had a plan. Insane, impossible, no doubt, but a plan nevertheless.

He peered cautiously down again. The great hall seemed bare of all life forms. Without question, the ones of Oriuz had catapulted from their planet, were winging their way to the captive Aldahor.

Not without an inward qualm, Jim stepped off the platform. He knew that here there was neither height nor depth, nor gravitation to tug his body and

bring it crashing to the ground; but old use and wont were too instinctively embedded to be cast aside thus summarily.

Supposing—

He floated!

The withheld breath escaped slowly from his pursed lips. From contact with Insar he had learned the secret of locomotion in Infra-Universe. It was a matter of will. He forced his thoughts into his muscular coördinates. He descended, not rapidly at first, because he did not quite know his powers, but with increasing velocity as his confidence grew.

He decelerated easily and effortlessly as he neared the ground. He landed lightly, looked swiftly around. There was no one in all the vast tower. He swung eagerly to the nearest vent. It would be much simpler than he had anticipated. With the Orimuzians intent on their captive planet, on the horrible work of transposition, he could easily go—

Vast, furious thought surged through his skull, battered his reeling senses in a roaring torrent. "You have managed to elude our search long enough," it pounded. "But we have you now, Insar. Your Earth form will hide your guile no longer."

Jim whirled in the direction of the beating waves, gasped. Before him, on the hitherto empty central throne, a giant shape was slowly shimmering into visibility. Kam, the mighty one!

Kam's great globular head bent down. Huge eyes shaped into being, filled with cruel mockery. "I thought that you might still be hiding somewhere in the tower of Orimuz, O Insar!" He grinned. "That was why, before my subjects went to seize the captive Aldahor, I had a paralysis beam of low intensity trained on me. It was sufficient to slow down the atoms of this form to near-zero vibration. Widely spaced as they are, I, Kam, the mighty one, vanished from view. But enough of thought-

remained in the residual *me* to impact the automatic inducing current, to switch it off.

"I saw you descend, or rather, sensed the vibration of your motion, acted, and here I am—and here you are! A splendid trick, don't you think, O Insar? You would not have thought it out in your palmiest days. Ho! Ho!" His head went back, and waves of laughter streamed around Jim.

Jim swung suddenly, dived for the nearest vent. Once beneath, he might be—

He froze in his tracks, suspended in mid-motion.

"Oh, no, you don't," snapped Kam. "I am not such a fool as you seem to think."

Green paralysis rays ringed Jim's helpless form in a shimmer of frozen light. Across the vast red floor, through the dissolving haze of the opening wall, came dwarf guards, hyperbolic reflectors glowing angrily.

"Take him out to his fellows. Let their fates be his as well," Kam ordered. "But be careful—he is as elusive as thought itself. If he escapes, I'll place the ones responsible in the vegetative state for all eternity."

THEY ADVANCED on Jim, little sooty demons, grinning horribly. They picked up his rigid body as if it were a feather, tossed it across their twisted shoulders. The incredible mass of their bodies was as unyielding to the touch as his own frozen hardness.

Out through the wavering open wall they went, carrying him: Kam strode behind, a mile-high giant of iridescent nothingness.

Jim stared up at the void with frozen, unblinking eyes. Infinity was circumscribed, blotted out by the great bulk of the silver planet. The yellow transparency that sheathed Orimuz had slid away. Green swords of flame thrust at the shining orb of Aldahor, held it in

paralyzed embrace, even as Jim himself. As he heaved on rock-hard shoulders he caught another glimpse—sideways, this time. A sea of stalked, green-shining mushrooms waved back and forth in unison, stretched their slender stalks aloft like rubber bands. The cups of formless thought! Within them, quivering with anticipation, lay the life-bordering ones of Orimuz, sensing somehow that life, active, sentient, was soon to be theirs.

Kam grinned a vast grin of satisfaction. "Be patient, my brethren!" he told them. "Your eternity of waiting is over. Orimuz is triumphant. We planned for this many a weary æon, and the plans are bearing fruit. Aldahor will be destroyed, your traitorous brethren dispersed, and Infra-Universe will know no other but the mighty ones of Orimuz. Let us go!"

His great form rose, like shining fog lifting over the mountains of an infinitely remote Earth. Straight up from the green surface of Orimuz it shot, swift on its journey to the captive planet, Aldahor. The midnight shapes of Sirius followed after, and with them, Jim Wentworth, helpless, immobile, thinking slow, terrible thoughts. Kam was positive that Insar was still an interstitial part of him. What would happen when he discovered the truth?

The gleaming sphere filled all space, blotted out the void. It rushed to meet them. Then they were descending to its dazzling surface. An artificial world it was, graceful, lovely beyond all Earthly imagining. The rounded surface was of a silvery metal, chased with exquisite designs of hyper-geometric beauty. There were mathematical figures, whose fantastic curves seemed somehow to retreat into dimensions not for human sight; there were abstract designs that flowed and seemed alive to the fascinated eye. Brilliant colors inlaid the incised lines, made of Aldahor a shifting vision of æsthetic delight.

Jim, as he descended, made out the structure of the studding knobs which had flashed with such perilous fires when seen from the fragment of Earth. They were tremendous domes of many facets, cut like glittering diamonds, and an iridescent flame of ever-shifting color played over their angular surfaces.

They headed for the largest of the diamond domes. It was almost as huge in extent as the great tower of Orimuz. A subsidiary one stood guard at the portal. He bowed to Kam, the overlord, as the giant swept through. The dwarfs followed pell-mell, and with them, the rigid form of Jim Wentworth.

EVEN in his frozen state, Jim sucked in sharply the indescribable splendor of the immense interior.

But the creators of this mighty splendor, this unimaginable civilization, were lying on the crystalline floor, just as they had fallen—dim, huge, barely discernible frozen forms, immobile under the frigid embrace of the green radiance. Yet on their misty countenances there was a godlike benignity, a super-universe benevolence beyond all description. Kam himself, though huger than any, by the evil force of his own interstitial being, seemed a ravaged, fallen angel.

The subsidiary ones, fellows in outward form to the captive Aldahorians, were busied with the assemblage of certain strange machinery. Jim tried to blink and could not. Those machines, fantastic, with huge, gaping maws like dragon vents, curved into the insane patterns of ultra-dimensions, were, but on a vaster scale, what Insar, in the person of Matthew Draper, had erected on Earth!

Horror welled and froze. From their hideous maws would spew the weird emanations that would hurtle the disembodied entities of Aldahor to a shattering exile, there to wreak unwitting disease and desolation to the being of the galaxies.

Kam bent his moonlike eyes on Jim. "I am doing you great honor, O Insar," he said mockingly. "You shall be the first to be dragged out of your inuffling form, and sent, dispersed and desolate, into the hyper-universe."

Dwarf guards scurried his frozen body over the crystalline floor, placed it un-gently before the curving mouth of the central machine, different somewhat in design from the others. Lemon-yellow emanations leaped out, bathed his still-paralyzed form in fantastic glow. Kam bent his towering height to view the expected dissolution more closely. The subsidiary ones made a vast, intent circle. Between their giant legs the tiny Sirians peered and hissed excitedly.

The glow slashed through Jim with plucking fingers of fire. His body surged and heaved convulsively under the impact. His brain plucked at its moorings in an agony of tearing fury. The glow increased, sang with relentless power. Jim felt himself dropping through a haze of suffering; his mind swelled and jerked as if it would burst. But there was no dissociation. How could there be? Matter and thought were inextricably fused—were unity.

The emanations ceased; the glow died. Jim grew slowly aware of his surroundings. There was a mutter of movement around him. He lifted his head weakly; the paralysis had left him. Kam was staring down at him, his vast brow furrowed.

Jim grinned. "One up on you, O Kam!" he mocked. "I am not Insar; I am but Jim Wentworth, of Earth, alone and indivisible. Insar has escaped; you are not through with him."

A roar of thought shook Jim as though he were a leaf, made the very walls to sway and quake. "Escaped, has he? Not for long. Scatter, ones of Orimuz! Give the alarm. Let Aldahor, let Orimuz, let the triple sun, let all the universe be combed until he be

found and brought back to me. Find him, or feel the full weight of my vengeance!"

They scattered with a rush like the swash of a typhoon. Kam's wrath was not lightly to be aroused. "As for you," rasped the giant, "you infinitesimal, puny being who call yourself Jim Wentworth, I shall reserve your fate for later. I have far more weighty matters than your disposition to attend to now. Take him back to Orimuz until I am ready."

Obediently, two dwarfs swung him up and over their shoulders. Jim lay there, rigid, motionless. Then Aldahor spurned beneath their upward rush. Outside, the intervening void was thick with the formless blobs of the ones of Orimuz. They hurtled through space in a globulous rain, rearing from the cups of formless thought, surging with quivering avidity on Aldahor, seeking the mighty shapes that would give them active, inotile life. Jim shivered, and lay still.

The tiny Sirians hissed and grumbled to each other. Jim could not understand their speech, yet it seemed to him that they were discontented at the endless trek of the ones of Orimuz. They had been promised the giant bodies of Betelgeuse in exchange for sooty dwarf-hood. Would not that promise be broken in the hurry of events; would not all forms be tenanted by the time of their return?

THE vast amphitheater lay strangely dull under its bubble sheath of yellow crystal. The stalked cups no longer waved in eagerness. They were dim pools of somber green, vacant of their former occupants. Still hissing and squeaking, the dwarfs tumbled Jim close to the tower. He quivered and lay still, rigid as ever, staring up with unblinking eyes. He had seen something—or thought he had. One of the cups, close by, still held its shapeless ooze. Something had happened. The solitary one

of Orimuz had not followed his mates to activation.

Yet it must have been an illusion. For, as they swept past, and the motion of his carriers had jerked him round a bit, his eyes fell once more on the cup. It was tenantless, vacant as all the others. Strange!

An animated discussion was taking place between the guards. They grew excited. They squeaked and gibbered at each other. Their single eyes rolled with mingled fear and greed. Then, suddenly, they seemed to have come to a decision. As one, they turned and stared at him. Jim lay stiff and frozen as ever. They grinned horribly. Then, with a rush, they were gone, hurrying upward, back to Aldahor, fiercely intent on the promised transformations before it would be too late. Jim Wentworth was abandoned.

For a long time he lay on his back, staring with wide, frozen eyes at outer space. Orimuz was silent as a tomb; the intervening void was bare of occupants. Then, and then only, did he cautiously raise his head. He had been freed from the paralyzing influence in the dissociation bath, had pretended it ever since. Only rage at Insar's escape could have blinded Kam to the realization of his pretense.

There was no one around. Jim rose quickly. His legs tottered; his body was weak. But a driving will forced him on.

Slowly, his tired body moved over the ground, past the empty cups into the tower. The intervening wall was a thin mist of blood, left open in the excitement of Aldahor's capture. He went in. The vast hall was a thing of echoing shadows. All had gone, to partake of the spoils of the silver planet.

He stared down at the nearest pit, leading into the mysterious bowels of Orimuz. So far his luck had held. Would it continue to hold?

Silently, warily, he dropped through

the dim green glow into the hollow interior. The weird central globe of bright-green fire expanded and contracted with regular heat. The spoked tubes pulsed in sympathy, pumping green radiance to the outer surface of the planet. Thus far, everything was as it had been on his first journey into the depths—except that the shining column, which had fed the bath of preparation, was gone.

But the vast hollow was now tenantless. There were no endless streams of dwarfs straining under gigantic loads of fuel.

Jim's heart gave a great bound. Here indeed was a break; one that he had hardly expected. He knew exactly what he had to do. Insar had tried it, and would have succeeded, had it not been for his own ultra-stupid act in diverting the missile from its destination.

He dropped swiftly through a thousand Earth miles of emptiness. There was no air to resist his lightning progress. He breathed, and the strange space of this universe furnished energy to his heart and tissues, just as if there were present in fact the essential elements of life—air, food, water.

DOWN! DOWN! and still only the vibration pulse of the central glow disturbed the utter silence. His luck still held. He set his course for the gourd-like machine which he had smashed in the earlier encounter. It floated close to the power plant, its huge metallic pieces sluggish in the central void. With one of those great fragments to hurl full tilt into the pulsing glow, a tearing, crashing weapon, he might stop that regular beat, the flow of energy along the radiating tubes.

The power gone, the mighty paralyzing rays must necessarily cease to function. The giants of Aldahor, released from their prisoned helplessness, would rise and overwhelm the surprised forces of the invaders.

He swung close to a huge fragment. His eager fingers gripped on it, seeking a firm hold. Its mass was vast, its inertia great. He could not budge it. Grimly, he thought the problem out. There was only one way to do it. It meant suicide! Jim clenched his teeth, shot backward through the void a hundred Earth miles. He must die in any event. In fact, he had nothing to live for. Claire—

He shot forward again, hurtling with tremendous speed. He was a human bullet, a projectile of flesh and blood, a mass of terrific momentum. The impact of his downrushing body would hurl the metal lump irresistibly into the blazing sphere, there to wreak its wild destruction.

The jagged mass came up to meet him with alarming speed. He steeled his nerves for the frightful impact. Involuntarily, he shut his eyes. In another instant—

### VIII.

A VOICE CRIED OUT in shrill fear. "Jim! Jim Wentworth! Stop!"

Was he dreaming, or was he crazy? That voice, those accents! He forced his eyes open, shouted joyfully, unthinking: "Claire!"

Instinctive reflexes, inbred from long years in the jungle, were all that saved him from catapulting destruction. He jerked to a quivering halt not five yards away from the floating hulk, so sudden in his deceleration that the blood roared and pounded in every artery, hazing his senses, making girl and central orb and consciousness itself but a blur of flashing color.

Claire Gray had suddenly appeared from behind the power plant. She was between him and the green-pulsing sphere he had intended to destroy. Her Earth dress was but a mere wisp of torn stuff, concealing practically nothing. Her body was infinitely beautiful,

infinitely desirable. Invitation peeped from under long-lashed lids, seductive, alluring. "Jim!" she whispered throatily, "I have been waiting long for you. Come!"

One rounded arm went out to him in voluptuous gesture; the other swung at the same time from behind her back. For the moment Jim lost his head, jerked forward. Then he saw the heavy eyelids lift, saw the unveiled triumph, caught the stealthy movement of the hidden hand.

Realization flooded him with horror. He had forgotten! Before him was—only the helpless shell of Claire. It was Lel who had stopped him from his purpose, who even now was luring him to destruction. Already her right arm was swinging forward. In the dainty palm nestled a tiny mirror, glowing with green fires. The paralyzing ray!

Jim's own hand was a blur of lightning motion. It was wholly instinctive, a reaction to the stimulus of threatened danger. He did not know how it happened, but, thrusting forward, pulsing to the grip of trigger finger, was the automatic he had brought from Earth. "Drop it, Lel!" he heard himself say harshly, and did not recognize the voice as his own. "Drop it, or I'll plug you." The blue snout of the gun was centered on Claire's heart.

CLAIRE stared at him with startled eyes. Her hand still held the mirror of paralysis, but it made no farther move. An upward turn and it, too, would bear on the Earthman. Lel had never seen Earth's lethal weapon before, but Claire had, and knew its potency. And Claire's memories were at the service of Lel.

"Jim Wentworth, man of Earth," she said, "for the moment you had me what the silly creature whose body I possess quaintly calls *bluffed*. But you forget. If you loose that strange weapon of yours, you slay, not Lel, the im-

mortal, but the girl, Claire Gray, whom you love."

Jim staggered. It was true. He forced his voice to steadiness. Yet it was no more than a whisper. "I shall do even that. For her sake as well as the sake of all the universes. She will die; so shall I; but before I do Orimuz will be rendered helpless and Aldahor saved. Your evil being, Lel, divorced from the body that gives it life, can do nothing to prevent it."

They stared at each other, trying to read alien thoughts. Then Claire's lips moved again. "I do not believe it," she cried harshly. "You wouldn't dare. You love the girl too much." Her hand moved forward.

The cold sweat beaded on Jim's brow. Desperately, he screamed, "Before Heaven I'll do it! Drop the mirror, or I'll shoot."

But the paralyzing ray swung inexorably around. A cruel smile distorted Claire's face.

"Claire! I love you!" burst from Jim in anguish. "It is because I love you I will shoot. Forgive me!" His finger tightened; he breathed an agonized prayer.

Claire would understand, must! Her tortured spirit, submerged under incredible degradation, must approve of what he was doing.

His finger trembled. He must hurry. Already the fatal mirror was almost upon him, the green ray darting. Another instant's hesitation, and all would be lost. He pressed.

As he did so, another figure hurtled from behind the pulsing globe of energy. A tearing groan burst from Jim. He had waited too long. For the figure was that of Matthew Draper. Before the bullet left Jim's gun, before he could bring it to bear again, Draper would be upon him. He had permitted Earth sentiments to hold back his fire for fruitless parley.

The gun barked; the bullet sang its

song of death. Draper was a blur of catapulting motion. Jim blinked, stared foolishly at his smoking weapon, at the tableau before him. For Draper had smashed, like a bolt of lightning, not for him, but straight for the figure of Claire! The force of the impact sent her reeling and rocking out into the void. The paralysis beam cut a green swath through empty space, and Draper's long arms pinioned the struggling girl in crushing embrace.

"Quick!" the Earth scientist was shouting unaccountably. "Get the mirror, turn the ray on the metal mass. It will dissipate the inertia, send it crashing into the fiery orb. Hurry! The dwarfs are coming."

JIM SAW THEM. A horde of scaly Sirians, streaming through all the vents, hissing and shrilling with alarm. Kam had sent them, belatedly, to guard the source of all his power.

Jim did not understand exactly what had happened, how Draper had managed to wrest control from the one of Orimuz. But it was a time for quick action rather than for reasoned thought. He hurled himself upon the tiny mirror, still glowing with virescent paralysis, scooped it up, trained it on the gigantic mass of the machine. The metal seemed to quiver under the emanations, hazed slightly as the full force struck it.

Then Jim lunged forward, shoulder down. There was a sickening thud, a sharp stab of pain through bone and muscle. But the great block of metal rocketed off, went spinning and hurtling into the glowing central fires. There was a scream of dismay from the onrushing dwarfs.

Deep within the ball of energy something snapped. The huge machine had crashed into the inner core of pulsing atoms, whose disintegration powered all Orimuz. There was a blinding flash, a rain of fiery fragments, and—sudden darkness. Energy was dead! The

green glow of Orimuz was gone! The planet floated in the outer void, reft of motion, of evil force, like a ship wallowing in the calms.

A huge wail lifted from the frightened dwarfs. Panic invaded their beings. They cast their useless mirrors from them, fled in inextinguishable fear, smashing into each other in the lightlessness, blundering, bumping, shrilling.

But Jim paid no attention to the struggling horde. He was straining forward, calling on two names. "Claire! Draper! Where are you?"

"Here!" came the scientist's voice strongly. "I've still got hold of Lel—or Claire! Help me!"

Somehow he found them, gripped the still writhing form of the girl he loved. The squalling and rush of bodies had ceased. The dwarfs had found the vents, had fled to the surface, were even then catapulting madly into outer space, into the infinite void, anywhere, to get away from the swift vengeance they knew must follow.

"Wait!" whispered Draper. "There'll be help soon. With the paralysis rays lifted, the Aldahorians will have no difficulty in overcoming Kam and those few who will stick with him. They'll be here shortly for us."

Jim held tight to the squirming girl. He was still bewildered at the swift course of events. "But how did you do it?" he gasped. "How did you manage to overcome the one of Orimuz?"

Draper laughed. "I," he answered, "am Draper, it is true; but I am also another—one who had been *very* close to you, Jim. I am Insar!"

"Insar!" Jim cried. "How in Heaven's name—"

"I started for Aldahor," he explained, "but I was less than halfway there when the green rays gripped and held. If I went on, I, too, would have been rendered helpless. I swung back for Orimuz, therefore, and, in the confusion, managed to escape observation. I crept

into an empty cup of formless thought and lay quiescent, waiting. The others left, in obedience to Kam's command, for Aldahor. I remained, watching for my chance."

"Then it was you I saw," Jim said wonderingly, "and thought I was seeing things. For you disappeared quickly."

"Yes. I had found my opportunity. I oozed into the interior, seeking desperately some way to clothe myself in tangible form. Once embodied, I intended doing exactly what you have done. I blundered into Draper.

"The one from Orimuz paid no attention to me, thinking my floating entity one of his own kind, strayed from the fold. I was upon him, forcing my structureless ooze into every pore, before he knew exactly what had happened.

"He fought back, and would have won. But Matthew Draper recognized me, exerted all the force of his submerged intellect to help. Between us we were victorious. I drove the one of Orimuz out into the void, hissing and wailing, entered in his place, explained matters rapidly to my old friend. He understood at once. We came down here, found you—and Lel!"

"But where did you obtain the necessary activation during your formless state?"

Insar chuckled. "From you, friend Jim," he answered. "You forget that in the bath of preparation we fused slightly at the edges. I shall always have with me some part of Jim Wentworth; and you, my *alter ego*, will, during mortal life, have a constant reminder of that strange and alien being from a different universe. But here come my comrades."

Light streamed through a hundred orifices—blessed, white light, neither poisonous-green nor sinister-purple. The giants of Aldahor brought with them a captive Kam, and disgruntled subsidiary ones. The Sirian dwarfs had vanished

into an infinity profound, so had the ones of Orimuz, whose entities had been fused inextricably with the Earthmen. Long after, millions of æons, strange tales permeated the hyper-universe—of monstrous creatures who had somehow managed to break through the veil into their different space time.

But the fifty-odd Earth people who had escaped the ultimate fusion were rescued, dissociated. The naked shells of Kam, of Lel, of the others who had been caught, were thrust into a triply sealed metallic orb, inchoate, life-bordering, there to remain in harmless state for all eternity.

JIM WENTWORTH, Claire Gray, Matthew Draper, the pitiful few of all the colonists from Earth, stood once more on their fragment of homeland, stared with misted eyes at the Harbor House, then out at the triple sun, a radiant kaleidoscope of whirling color, the glistening sphere of Aldahor, basking in the kindly rays. Orimuz, tenantless, dark, had been banished to the farther spaces.

Once more their identities were their own, and Earth was beckoning. For around their tiny sliver of planet was a ring of *Agravs*, constructed under the supervision of Insar himself. He was a godlike form—a giant body, that had been captive to Kam, now returned to its rightful owner. His huge, iridescent face was filled with indescribable be-

nevolence; his saddened smile was a shining glory. His thought beat around the Earth people, sorrowful, regretting. It is still not too late to change your minds, friends of Earth," he said. "Give but the word and we shall build you a noble planet here where a future of happiness, of achievement, will await you."

Jim's arm tightened around the slender form of Claire. Once more she was clad in modest garments. She smiled at him happily, though the shadows of her humiliation still clung to her eyes.

"What do you say?" Jim asked her, asked Draper, asked them all.

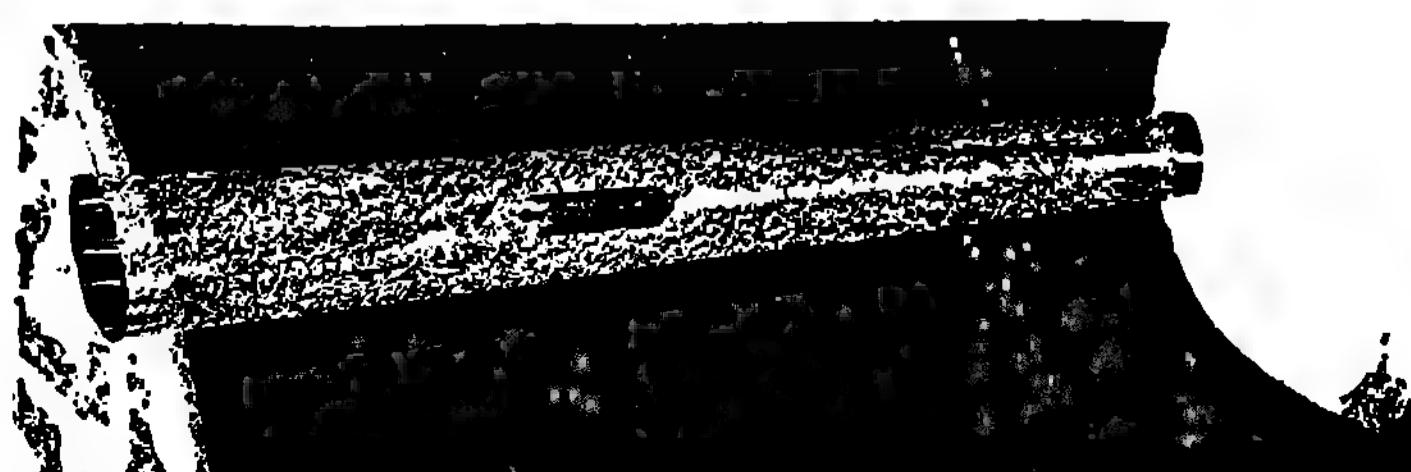
Their voices were a chorus of unanimity. "We are Earth people. Let us return to Earth."

Jim smiled up at the huge mistiness of Insar. "You see," he explained, "how it is." He was surprised to find that his voice quavered, and that there was a strange moisture in his eyes. He glowered at Draper, but Draper, too, was surreptitiously wiping an invisible mote from the corner of his eye.

Insar said slowly. "Yes, I see. Farewell, then, my friends, and may your native Earth be kind and fruitful to you. Farewell!"

His great arm lifted. The ring of *Agravs* hummed. The Earth people waved in final farewell. They were going home; they were returning to the hyper-universe of their own kind. The tremendous adventure was over!

THE END.



# Let's Get Down to BRASS TACKS



## AN OPEN FORUM OF CONTROVERSIAL OPINION

### Answers Questions.

Dear Editor:

I would like to answer a few of the questions presented in Brass Tacks.

Mr. Ellissen and others: An initial flash of lightning strikes upward, ionizing the air and clearing a path for the secondary and much larger discharge.

Mr. Campbell: I do not believe there are enough science-fiction stories to furnish a good monthly; so, unless you want second-rate stories, don't ask for extra editions.

Mr. Rosenthal: Matter is coalesced energy. It seems that if matter is dissociated, the energy will be released.

Space is not a vacuum. It contains an unmeasurable, all-permeable substance known as ether.

Mr. Mackay: Get a physics textbook and look for Pascal's Law.

Mr. Lewis: Ages ago, a race of men known as the Cro-Magnons appeared in England. They had tremendous brains, but vanished for no apparent reason. They represented a spurt in man's evolution, yet when they disappeared, man's evolution dropped to its previous level. Don't discredit geologists so easily.

Mr. Bott: I would like to settle the acid question once and for all:

1. Only ionized substances take part in reactions.
2. Pure concentrated  $H_2SO_4$  is unionized.
3. Therefore, pure  $H_2SO_4$  will not act on metals.
4. C. P. Metal will not react with acid.
5. An impurity is necessary for an electric potential to be formed.
6. The substance reacted on must be impure.
7. Hydrogen will replace only more active metals.
8. Such metals (Zn, Fe, Na, Al, etc.) are attacked by acids.
9. Copper, tin, lead, gold, silver, mercury are less active.
10. These metals are not replaced by hydrogen (in acids). Exceptions:  $HNO_3$  has an oxidizing action on most metals.

Pure  $H_2SO_4$  has a dehydrating action on carbohydrates.

From the above statements I am sure the readers can draw any conclusions they require. The stories rating highest in this issue were,

in relative order, *Dynasty of the Small*, *The Eternal Wanderer* and *The Path*.

I believe that Mr. Rocklynne is befuddled as to the practical application of Archimedes' age-old problem. The strongest and most important part of a lever is the fulcrum. Yet Mr. Rocklynne states that the sun will offer little resistance to the lever (force beam) when it should offer the most in order to carry out its function as fulcrum.

*Anton Moves the Earth* also strays from logic in a few minor matters. Human stokers are used on the ship, when, even to-day, automatic stokers are in common use. In the story, gems are a definite article of value, when in our times diamonds are being successfully manufactured artificially.

In *The Last Selenite*, the force beam is supposedly pointed at the Earth, yet the illustration shows the beam directed in a different direction.

The addition of heat cannot start, but only accelerate a reaction.—I. Edward Chernoff, 45 Hegeman Avenue, Brooklyn, New York.

### Defends Lovecraft.

Dear Mr. Tremaine:

Regarding the department, Science Discussions, you propose to inaugurate, briefly, I am for it. You will also take heed that I am writing my first letter to you in response to your talk in the November issue of Astounding Stories. If Science Discussions does replace Brass Tacks, you may be assured of many letters from me in the future.

As to Astounding Stories itself, I have no complaints to offer at present. But I will say this: anybody who says H. P. Lovecraft's works are not fit to appear in Astounding Stories is absolutely unbalanced. Any magazine should be proud to print such well-written articles as Mr. Lovecraft's. Take my opinion for what it is worth, but I think that Lovecraft's style is as good, or better, than Poe's, and that is something. Just look at the sentence construction and be aware of the atmosphere created. Any one with a little knowledge of English will know what I am talking about. In conclusion, how about some more stories by Dr. E. D. Smith

soon and less criticism of Lovecraft by the readers? I know some will stand by me.—James Gardner, Jr., White Sulphur Springs, West Virginia.

### Favors Science Discussions.

Dear Mr. Tremaine:

Your editorial in the November Astounding was fine.

I am very much in favor of the department you suggest to take the place of Brass Tacks. I have always felt it unjust that a department representing such a small proportion of the readers should be given such a large proportion of space for presentation of things that were only mildly interesting. Replacing Brass Tacks with Science Discussions will be a major improvement, and I shall do all I can to see that my many friends take part in this new department.

I suppose that the lines which Science Discussions will follow have not yet been fully worked out. However, I'd like to know if there will be any taboos. Suppose a discussion on the problem of how the Egyptian pyramids were built starts; this is likely to lead to a discussion of why they were built, whether for tombs or schools or religious purposes. Which, in turn, might bring up some religious aspects. Would this sort of a discussion be subject to editorial censorship? If so, I feel that the department will suffer. Also, if some one wishes to say that the Moon is made of green cheese, must he offer proof or may he submit the idea and ask some one to disprove it?

At any rate you are assured of my support for Science Discussions and for Astounding Stories.—C. Hamilton Bloomer, Jr., 434 Guerrero Street, San Francisco, California.

### Another Booster for Science Discussion.

Dear Mr. Tremaine:

Your idea of Science Discussions to take the place of the present department, Brass Tacks, is very good. I always read Brass Tacks first, not because I may or may not agree with the various writers, but mainly to see if I can find some new—to me—fact.

Personally, I don't care whether one group or another likes or dislikes a certain story. If I like a story, that is a point for the magazine; if I dislike one, that's a mark against the magazine. When I find my dislikes are in the majority, I merely stop buying that particular magazine. I imagine 99 per cent of your readers do the same thing. You don't really need our comments, although I dare say they may help. Just look at your circulation. That tells a lot.

Science Discussions should be a very popular department, but don't make it *too* technical. I'm just one of those "poor dubs" who have forgotten most of the math and science they taught us in school.—Lester W. Smith, Hotel Carlton, 14th and Washington Streets, Portland, Oregon.

### Could Life Exist Without Air?

Dear Editor:

Your announcement of Science Discussions prompted me to scribble off a few lines to you and Astounding.

This new department sounds pretty good to me. I have a number of pen friends, and quite often we get into some crazy science discussions. I presume this new department will contain discussions on all things under the Sun: to-day's science, to-morrow's science, yes, and even science that exists only in the writers' minds. Am I right? And I also hope this will mean the dawn of an era wherein science will be the framework of your stories. I'm one of those fel-

lows who like science-fiction, not just fantasy. However, your stories are good—that I enjoy them is evident, as I buy *Astounding* monthly, now.

By the way, ask Campbell this, will you? In *Red Death* he assumes that the Martians would have enormous lung capacity. Well, in the enormous length of time that it took Mars to lose its atmosphere to such an extent, wouldn't it be possible that the Martians would have evolved in the direction of doing without air, or using very little of it? Just because we need air on Earth, is it so impossible for life on another planet to do without, if evolution has made their bodies so?

Suppose our atmosphere began to disappear ever so slowly. Suppose it took 1,000,000,000 years to almost completely vanish. The change from generation to generation would be so slight as to be unnoticeable. But wouldn't each succeeding generation adapt itself to the slight atmospheric difference? By the time the 1,000,000,000 years had gone, isn't it plausible to suppose the human body would have changed to the point where air would not be needed, or very little of it needed to support life? Couldn't the same thing have happened to our friends on Mars?

Scientifically, Astoundingly, and sincerely yours.—Leslie A. Crutch, Parry Sound, Ontario, Canada.

### Bacteria Increase In Size?

Dear Editor:

Considering the countless years that man has evolved, it is very remarkable that an elementary cell, such as a bacterium cell, could evolve into a specialized, thinking creature in three short years. I believe Fearn is wrong in saying that the bacteria would increase in size. In numbers, yes—but not in size. On Page 69 Northern asked this question: "But is it possible for bacteria to grow?" Ah, I thought, here comes an explanation! But, here was the answer: "Of course, with all opposition removed." Then a discussion of the balance of nature, which does not answer the question. The removal of opposition would permit unobstructed division—not a growth in size.

For the purposes of a story, Fearn, in the conclusion, has the "grown-up" bacteria die of overpopulation. They should have died in the beginning; but then, where is the story? It is well known that bacterial toxin is poison to the very ones producing it. That is one of nature's best checks.

Regardless of the above, I enjoy this type of story, *Dynasty of the Small*, better than planetary tales—especially those of Kruse. Fearn's idea of olfactory speaking was the bright spot in his story.—Donn Brazler, Milwaukee, Wisconsin. P. S. As a response to Science Discussions, I hope this is O. K. Your idea is a fine one and will add much to "the peer of its class."

### An Inventor Wants Help.

Dear Editor:

I am afraid that things sometimes go too far in this knocking business. While it may be all right to feel a strong antipathy for some one else's ideas, must one use up the valuable space in Brass Tacks for knocking that person's ideas, and, incidentally, that person's person?

Let's have constructive criticism. That shouldn't be hard to produce, if you really think you have a reason to kick.

I can't kick; I like all the stories. I may not like some so well as others, but should I cry and kick that it's rotten on that account?

On the November cover the thought is fairly close to the story, but it could be closer.

I started science-fiction with Jules Verne, and read *Tyranno, The Conqueror*, fourteen years

ago in "Science and Invention." I've read everything scientific since, and enjoy all three magazines, but prefer Astounding, as it runs almost all good stories, while others have good stories once in a while.

So, kickers, squallers, and chronic complainers, kick constructively, not just to show off your bad temper, etc.—The McGee, Gen. Del., Dishman, Washington.

P. S. You can, if you wish, tell the readers that, through a hint I got from a science-fiction story two or three years ago, I have developed a heat beam. I can melt brass and aluminum two feet from the lens' orifice, but the one-inch beam spreads to two feet at fifty feet, and the air takes up a lot of the heat in that distance. But it's hot enough to make a man move fast. I'm experimenting on a high-frequency-coil assembly for tightening the beam down.

There's just one thing wrong: it would cost about six hundred dollars to run the beam for thirty minutes.

Maybe some Brass Tacker can suggest some way to tighten the beam. I can't use a lens, because no transparent material I know of will stand 5,300 degrees Fahrenheit. The McGee.

### Does This Answer Your Query, Mr. Vickers?

Dear Mr. Tremaine:

In answering Mr. Vickers, who objects to my statement, made in the article, *The Veiled Planet*, that "pressure applied to either bromine or iodine immediately restores it to a liquid," I am somewhat handicapped in that I am not certain as to his point of objection. I imagine, however, that it may be a question of the physical state of iodine.

At Earth-normal temperatures, iodine is a solid forming steely, flat crystals, but having quite a high vapor pressure. Like a number of other substances—camphor, solid carbon dioxide, and other less well-known substances—iodine cannot exist in the liquid state under Earth-normal conditions.

The statement quoted above was made in connection with the discussion of the possibilities of life on planets under widely different conditions. I had suggested that bromine or iodine might serve as the active gas in the atmosphere, with the proviso, however, that the temperature of the planet must be higher than that of Earth, about 200° C. in the case of iodine. Farther on, I added that in the case of such gases as hydrogen and oxygen, immense pressure would increase their reactivity, thus making high temperatures unnecessary, though pressure applied—and so forth. Under those non-earthly conditions—a temperature of 200° C. and great pressure—iodine can exist only in the liquid state. Consider it this way: on Earth, in an open room, carbon dioxide can exist in only two states—the solid or the gas. Liquid carbon dioxide is impossible then? Under normal Earthly conditions, it is. But most of the carbon dioxide sold is in the liquid state, because, at room temperature, carbon dioxide cannot exist as a gas, when under a pressure of 1,000 pounds per square inch. It becomes a liquid.

So with iodine. At 200° C., under great pressure, iodine becomes a liquid. Any handbook will give you the melting point—113.5° C.—of iodine, which would be impossible if it had no liquid phase. As a matter of fact, every element must have all three phases, even the most stubborn, helium at one end of the scale, and tungsten at the other. Though helium is solid only at a temperature within a hairbreadth of absolute zero, and tungsten a gas only above 5,500° C., at various points in these articles, just as at various points in the universe, we will encounter both.

Actually, had I said that "iodine is restored to a solid" that would have been a slip, for, under the conditions named, iodine could not have been a solid.

If I've missed your point, Mr. Vickers, let me know. I think I can guarantee all information in the articles within the limits of our present knowledge, and the limits of practicable explanation. By the latter, I mean that, for instance, Newton's law of gravity— $F = \frac{k}{d^2}$

—is not exactly accurate, of course. It should be corrected to Einstein's laws. The change, however, is so slight that for only the most exceptional cases, such as very near suns and in the whole sphere of space, is it important. The explanations, further, are impracticably difficult.

However, there will be no gross errors, if I can possibly avoid them.—John W. Campbell, Jr.

### Wants Authors with a Sense of Humor.

Dear Editor:

Science Discussions promises to be a good idea. But you say it will take the place of Brass Tacks. I think it would be better to keep both departments. Shorten Brass Tacks and confine it to letters pertaining to the magazine itself. Have Science Discussions as a separate department, where readers can advance their scientific theories and discuss them. It doesn't seem to me that Science Discussions, by itself, will ever be as large or as representative as the present Brass Tacks department, simply because not enough readers will have new ideas or the urge to submit them for discussion. In other words: Science Discussions will not be a success by itself—but it will be very valuable as a supplement to the present Brass Tacks. Therefore, add Science Discussions, but do not remove Brass Tacks. Have two departments. How about it?

Ross Rocklynne is to be complimented on *Anton Moves the Earth*. It is refreshingly free from the heavy and melodramatic style which characterizes so many stories dealing with this theme. It is surprising how a few touches of comedy will improve a story. For example: "Ah-h!" he growled at the billions of Earth's inhabitants. "I'll save your old world!" Let's have more stories by authors with a sense of humor!

A quotation from Robert Madle's letter in the November issue: "Have you noticed all the readers asking for a quarterly? I have, and I agree. We must have an Astounding Stories quarterly." This expresses my opinion exactly.

Your November issue was one of the best you have printed: Brown did a splendid job on the cover; the stories were all without reproach; Dold was very good on the inside illustrations; J. W. Campbell's article was interesting. All in all, it was a very fine issue.

Let those few readers who say Astounding Stories is slipping take the November issue and compare it with any previous issue. You are, perhaps, not ascending like a skyrocket, as in 1934, but you are nevertheless definitely improving with each issue. Keep it up!—L. P. Wakefield, 2832 Marshall Way, Sacramento, California.

### Zero and Infinity Extremes of Concrete Quantities.

Dear Editor:

It is hardly necessary for me to offer comment on the magazine; it speaks for itself. But what is this about abolishing Brass Tacks? Science Discussions by all means, but not at the cost of the loss of Brass Tacks. Why, man, to do that would be to sap the vitality of the whole magazine! Avid—or at least moderately avid—readers like myself are highly interested in what others think of the stories, articles, illustrations, etc., in the magazine. Rather than abolish Brass Tacks, increase it in size

and even add editorial comments at the end of the letters. Then will the readers be satisfied, the quarterly come, and the millennium descend upon the Earth.

As to Mr. Driggers: I admit that numbers beyond infinity are unlikely, but the fallacy is not so obvious as you seem to think. My contention was that zero and infinity were the extremes of concrete quantities; mathematical abstractions were not even mentioned in my premises. I believe that the very fact that there is an infinity beyond zero is proof, of sorts, that there *may* be a zero beyond infinity. I presume that I have not made myself any clearer; in which case I would be pleased to correspond with you personally.—Elton Andrews, 349 St. John's Place, Brooklyn, New York.

### A Discussion of Space.

Dear Editor:

In answer to Herbert Rosenthal's letter in October Astounding Stories, I doubt if any one really knows why there is so much energy to be gained from smashing the atom. Of course, there are several theories about this, as there are about almost everything, but I don't think any of them have been proven as yet. It is believed that said energy exists because no other explanation seems to fit certain phenomena such as the energy of the Sun. No other hypothesis yet advanced can explain the fact that the Sun has been radiating for approximately 15 million million years (Sir James Jeans) and for most of that time at a rate greatly exceeding the present output. Also, some of the cosmic rays of lowest entropy have such a very great energy that no single event other than the exploding of one of the simpler atoms seems to adequately explain it. (I say single event because, naturally, a quanta of radiation must be formed all at the same time and at the same place). Of course, if cosmic rays are not radiation at all but high-speed electrons, this argument is not valid.

You say that gravitation does not affect the curvature of space. I believe that Einstein says that it does, and I am inclined to think that he is an authority on the subject. Of course he may be wrong; space may not be curved at all. Who knows?

As for your very positive statement that space doesn't exist (materially, I suppose you mean) or that it is a vacuum (?), you have no right to say that. It has never been demonstrated. There is again that "of-course-you-may-be-right" clause, but you wouldn't know if you were. How would your nonexistent space transmit radiation?

Your criticisms of Mr. Gutierrez's criticisms of you are most unfair. He did not say that his line on the coil of paper was straight; he only said that it did not end. Also, as he says, you may find mentioned in almost any book on the subject the possibility that space is curved, not in three, but in four dimensions. Hence, your statement that curved space would necessarily be in the form of a sphere, or looped, is false. Our minds cannot grasp a picture of space curved in four dimensions, but it can be pictured mathematically.

You argue that a line has a beginning and an end. By definition a straight line extends indefinitely in both directions. If space is curved, you no longer have a straight line, but a geodesic. (This is still the shortest distance between two points.)

You say you believe that the fourth dimension is weight. Why not say it is density. Then you have:

lw-area  
lwh-volume  
lwhd-weight

with weight a four-dimensional analogy to three-dimensional volume and two-dimensional area. (If density has anything at all to do with the fourth dimension, it is probably as a manifestation of extention in said dimension, and not as reality. But I fail to see why density should have anything to do with the fourth dimension.

I merely mentioned this to show that it would be better than having weight as that dimension.)

You also say that there is very little one can discover about age while handling an iron cube, but if it were not for time, you could not handle the cube at all, since matter exists only in the three-dimensional time continuum and not just in three space.

You say that Lovecraft should write for a magazine called "Ghost Stories for Five-Year-Olds." Perhaps his stories are a bit weird in parts, but some of his ideas make as good science-fiction as that of most writers of science-fiction. And as for your allusions to five-year-olds, is that fair? His style is most entertaining, and the least childish of any of the stories printed in Astounding Stories. I would advise you to reread his stories and try to look at them from a broader viewpoint. Just because his ideas are revolutionary does not prove that they are "ghost" stories. I feel sure that you will at least change your mind about the five-year-olds if you do re-read them.

I am sorry, Herb, if I have stepped on your toes, but you asked for it. No hard feelings, I hope.—Frank Driggers, 743 Spruce Street, Berkeley, California.

### Questions Atomic Power.

Dear Editor:

You say you have only heard from two per cent of the readers in your discussion. I think the other ninety-eight per cent are like me, satisfied.

I am thirty-four years old, a letter-carrier, do a little microscope work, and right now am collecting the junk needed for an eight-inch telescope.

I'm very well satisfied, as it helps a curious mind to develop for the to-morrow.

The only kick I have to make is in the atomic-power machines your authors have invented. What power?

We know, if they used that little wheel we see in jewelry windows—one side white and one black, revolving by light pressure in a vacuum—we have power. Or, take the thermo couple, give it heat at its junction and you have power.

This is as hertzian waves once were, but will some day be developed to wireless, then to radio and finally to television or radion television.

No scientist has yet got any power of any sort from any atom, so why bring that up, when we have two other sources of undeveloped power?

Outside of atomic power, I'm one of your very well-satisfied patrons, and feel I don't have to write to you.—M. J. Lyons, 10712 Bryant Avenue, Cleveland, Ohio.

### An Idea for Consideration.

Dear Editor:

After reading your article on Page 123 of Astounding Stories, I decided to sit down and write you a letter, and the letter which I am now writing is going to be different.

We are going to have a dandy World's Fair here in the San Francisco Bay in 1939. It is under construction now and, believe me, it is going to be a wonder.

Now, to get to the reason for writing you this letter: I wonder if the readers of Astounding believe that science-fiction should have an exhibit at the Fair? If they do believe that science-fiction should, why? If not, why not? Also, if they do believe that such an exhibition should be placed in the Fair, what kind of an exhibition should it be? Also, how should it be financed?

One other question and I shall close: will some of the readers tell me why parts of this Earth have so much rain while other parts have little or none? We haven't had any rain here in Oakland for three and one half months.—Fred G. Michel, 1416 East 31st Street, Oakland, California.

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